OCCUPATIONAL ANALYSES SERIES

Motorcycle Mechanic

2006

Human Resources and Social Development Canada
Ressources humaines et Développement social Canada

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Occupational Analyses Series

Motorcycle Mechanic

2006

Trades and Apprenticeship Division

Human Resources
Partnerships Directorate

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Mécanicien/mécanicienne de motocyclettes

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The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Occupational Analysis as the national standard for the occupation of Motorcycle Mechanic.

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LIST OF RED SEAL NATIONAL OCCUPATIONAL ANALYSES

TITLE	NOC* Code
Appliance Service Technician (2005)	7332
Automotive Painter (2005)	7322
Automotive Service Technician (2005)	7321
Baker (2006)	6252
Boilermaker (2003)	7262
Bricklayer (2000)	7281
Cabinetmaker (2000)	7272
Carpenter (2005)	7271
Concrete Finisher (2006)	7282
Construction Electrician (2003)	7241
Cook (2003)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician – Consumer Products (1997)	2242
Farm Equipment Mechanic (2000)	7312
Floorcovering Installer (2005)	7295
Glazier (2004)	7292
Hairstylist (2005)	6271
Heavy Duty Equipment Technician (2004)	7312
Industrial Electrician (2003)	7242
Industrial Instrument Mechanic (2000)	2243
Industrial Mechanic (Millwright) (1999)	7311
Insulator (Heat and Frost) (2000)	7293
Ironworker (Generalist) (1993)	7264
Lather (Interior Systems Mechanic) (2002)	7284
Machinist (2005)	7231
Metal Fabricator (Fitter) (2003)	7263
Mobile Crane Operator (2006)	7371
Motorcycle Mechanic (2006)	7334

Motor Vehicle Body Repairer (Metal and Paint) (2005)	7322
Oil Burner Mechanic (2006)	7331
Painter and Decorator (2000)	7294
Partsperson (2005)	1472
Plumber (2003)	7251
Powerline Technician (2004)	7244
Recreation Vehicle Mechanic (2000)	7383
Refrigeration and Air Conditioning Mechanic (2004)	7313
Roofer (2006)	7291
Sheet Metal Worker (2006)	7261
Sprinkler System Installer (2003)	7252
Steamfitter – Pipefitter (1996)	7252
Tilesetter (2004)	7283
Tool and Die Maker (2005)	7232
Transport Trailer Technician (2003)	7321
Truck and Transport Mechanic (2000)	7321
Welder (2004)	7265

* National Occupational Classification

Requests for these publications should be forwarded to:

Trades and Apprenticeship Division
Human Resources Partnerships
Human Resources and Social Development Canada
140 Promenade du Portage, Phase IV, 5th Floor
Gatineau, Quebec K1A 0J9

These publications are also available to order or download online at: **www.red-seal.ca**.

A comparative listing of apprenticeship training programs across Canada may be accessed at **www.ellischart.ca**. The Ellis Chart also lists the current provincial and territorial trade names.

FOREWORD

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to co-operate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources and Social Development Canada (HRSDC) sponsors a program, under the guidance of the Canadian Council of Directors of Apprenticeship (CCDA), to develop a series of occupational analyses.

The Occupational Analysis Program has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations;
- to identify those tasks that are performed by skilled workers in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Standards "Red Seal" Examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility, in Canada, of apprentices and skilled workers;
- to supply employers and employees, and their associations, industries, training institutions and governments with analyses of the tasks performed in particular occupations.

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GUIDE TO ANALYSIS

DEVELOPMENT OF ANALYSIS

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators. This draft analysis identifies all the tasks performed in the occupation.

The draft is translated and reviewed by the NOA Team of HRSDC. A copy of this analysis is then forwarded to provincial/territorial authorities for review by specialists in the field. Their recommendations are assessed and incorporated into the final draft.

The occupational analysis is published in both official languages.

STRUCTURE OF ANALYSIS

To facilitate understanding of the nature of the occupation, the work performed is divided into the following divisions:

BLOCK – is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

TASK – is the distinct activity that, combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

SUB-TASK – is the smallest division into which it is practical to subdivide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Supporting Knowledge & Abilities

The elements of skill and knowledge that an individual must acquire to adequately perform the sub-task.

Trends

Any shifts or changes in technology that affect the block.

Related Components

All components related to a specified task being undertaken by the motorcycle mechanic.

Tools and Equipment

All tools and equipment necessary for the motorcycle mechanic to perform the work on all given tasks identified within the block.

Context

A statement written to clarify the intent and meaning of blocks in the analysis.

VALIDATION METHOD

At the request of the Canadian Council of Directors of Apprenticeship (CCDA), the Standardization Sub-committee developed a method for validating the Red Seal National Occupational Analyses.

A draft of the analysis is sent to all jurisdictions for validation. Each jurisdiction rates the sub-tasks and applies percentage ratings to blocks and tasks. This method for the validation of the National Occupational Analysis identifies common core tasks across Canada for a specific occupation. This feature facilitates the weighting of the Interprovincial Standards "Red Seal" Examinations.

DEFINITIONS

YES: the sub-task is performed by workers in the occupation in a specific jurisdiction.

NO: the sub-task is not performed by workers in the occupation in a specific jurisdiction.

BLOCK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each block of the analysis.

TASK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each task of the analysis.

NV: Not Validated by a province/territory.

ND: Not Designated in a province/territory.

PROVINCIAL/TERRITORIAL ABBREVIATIONS

NL: Newfoundland and Labrador
NS: Nova Scotia
PE: Prince Edward Island
NB: New Brunswick
QC: Quebec
ON: Ontario
MB: Manitoba
SK: Saskatchewan
AB: Alberta
BC: British Columbia
NT: Northwest Territories
YT: Yukon
NU: Nunavut

COMMON CORE

The criteria for determining common core depend on the performance of sub-tasks. If at least 70% of the responding jurisdictions (excluding NVs and NDs) perform a sub-task, it shall be considered common core.

Interprovincial Standards "Red Seal" Examinations are based on the common core identified through this validation process. Validation identifies what will be assessed through the interprovincial examination.

BLOCK AND TASK WEIGHTING (APPENDIX C)

This appendix represents the block and task percentages as submitted by each jurisdiction.

Each jurisdiction, with the use of a provincial/territorial occupational advisory committee, validates the content, places percentages on blocks and tasks, and indicates whether or not the sub-tasks are performed by the skilled workers within the occupation. The results of this exercise are submitted to the NOA Team who then analyzes the data and develops this appendix which provides the individual jurisdictional validation results as well as the national averages of all responses.

PIE CHART (APPENDIX D)

The graph depicts the national percentages assigned to blocks in the analysis.

SCOPE OF THE MOTORCYCLE MECHANIC OCCUPATION

Motorcycle mechanics work on motorcycles and other vehicles such as motor scooters and all-terrain vehicles. They assemble, diagnose, maintain and repair engines, transmissions, drive systems, steering assemblies, braking systems, chassis and suspension, electrical systems, and fuel and exhaust systems. They may specialize in repairing, rebuilding, customizing or servicing these systems or assemblies.

Motorcycle mechanics work with hand, power, pneumatic and measuring tools, shop equipment, and diagnostic and testing tools. Reference material, documentation and computers are also important tools in this trade.

Motorcycle mechanics may work in service shops of motorcycle dealerships and retailers or in independent service establishments. They may specialize in specific motorcycle makes, types or components.

The work environment may include noise, fumes, odours, hazardous compounds, drafts and vibrations; therefore, safety procedures are important. The work often requires considerable standing, bending, crawling, lifting, pulling and reaching.

Some important attributes of motorcycle mechanics are good hand-eye coordination, mechanical aptitude, time management skills, logical thinking and decision making skills, excellent communication skills and the ability to educate themselves as technology advances. They should also be competent to test ride motorcycles.

Experienced motorcycle mechanics may advance to supervisory positions, shop foreman, service manager or instructors. Some mechanics may open their own garage or motorcycle specialty shop. With additional training, motorcycle mechanics can transfer their skills and knowledge to related vehicles and equipment such as snowmobiles, watercraft and outdoor power equipment.

OCCUPATIONAL OBSERVATIONS

Tools
There are more tools available for data analysis and diagnostics such as laser alignment and scan analyser. These tools are more efficient in the diagnosis of motorcycles.

Accessories and Ancillaries
Linked brake systems apply predetermined pressures to both front and rear brake with a single lever action; this is new technology that is advancing the motorcycle field. Alarm systems and global positioning systems (GPS) are also new consumer products that motorcycle mechanics are responsible for installing.

Materials
Materials are lighter, stronger and more durable. Resins, alloys, carbon fibre, ceramics, composite materials, and synthetic fluids are also used on a regular basis in the motorcycle mechanic trade.

Work Processes and Tasks
The increased use of electronic systems has meant that more work processes and tasks are completed using computers. Tasks may be completed quicker with the use of electronic diagnostic tools.

Skills/Abilities/Learning
Among motorcycle mechanics there is an increased need for computer literacy, knowledge of applied technologies and good product knowledge. For liability purposes there is a need for an increased knowledge of work processes. Applied technologies and sciences have resulted in advancements in many of the systems of motorcycles. Mechanics must be computer literate in order to access product knowledge that may be available in the form of a CD-ROM, Internet sites or other electronic documents. Many motorcycle mechanics also attend training sessions on new technologies and products as sponsored by the dealer.

Customers
Customers want new technologies and safety enhancements such as air bags and GPS systems. Customers are better educated on motorcycles and the latest technologies available and have higher expectations for service and quality. The ease of use of motorcycles has opened the field for more non-traditional motorcycle riders. More customers are requesting personalized cycles with new designs and custom applications.

Safety
The safety of the mechanic is very important as is the safety of the rider. Motorcycle mechanics receive more training and have increased skill levels in the safety features of motorcycles. Being environmentally responsible (e.g. recycling materials and components) is also common practice in all work sites.

SAFETY

Safe working procedures and conditions, accident prevention and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties are aware of circumstances and conditions that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that a safety-conscious attitude and work practices contribute to a healthy, safe and accident-free working environment.

It is imperative to apply and be familiar with the Occupational Health and Safety Acts and Workplace Hazardous Material Information System (WHMIS) Regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

As safety education is an integral part of training in all jurisdictions, personal safety practices are not recorded in this document. However, the technical safety aspect relating to each task and sub-task are included throughout this analysis.

ANALYSIS

BLOCK A

OCCUPATIONAL SKILLS

Context: *Motorcycle mechanics must use tools and maintenance information to perform all tasks in their trade. Organizing work includes using documentation, communicating effectively and working within the parameters of shop policies. Motorcycle mechanics must adhere to safety procedures and regulations. Work practices in this block are those tasks which may be repeated throughout this trade.*

Trends: *There are more efficient tools, methods of repair and more sophisticated diagnostic techniques. Workplaces have become safer and there are stricter safety requirements. There is more access to trade information through new information technologies such as the Internet and CD-ROMs. Newly developed motorcycles require less frequent maintenance.*

Related Components: All components apply.

Tools and Equipment: See Appendix A.

Task 1 Uses tools and equipment.

Sub-task

1.01 Uses hand tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.01.01	knowledge of types of hand tools
1.01.02	knowledge of hand tool operating procedures
1.01.03	ability to select hand tools
1.01.04	ability to organize hand tools
1.01.05	ability to maintain hand tools
1.01.06	ability to recognize worn, damaged or defective hand tools
1.01.07	ability to store hand tools

Sub-task

1.02 Uses power tools. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.02.01	knowledge of types of power tools
1.02.02	knowledge of power tool operating procedures
1.02.03	ability to select power tools
1.02.04	ability to organize power tools
1.02.05	ability to maintain power tools
1.02.06	ability to recognize worn, damaged or defective power tools
1.02.07	ability to store power tools

Sub-task

1.03 Uses pneumatic tools. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.03.01	knowledge of types of pneumatic tools
1.03.02	knowledge of pneumatic tool operating procedures
1.03.03	ability to select pneumatic tools
1.03.04	ability to organize pneumatic tools
1.03.05	ability to maintain pneumatic tools
1.03.06	ability to recognize worn, damaged or defective pneumatic tools
1.03.07	ability to store pneumatic tools

Sub-task

1.04 Uses cutting and heating tools and equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

1.04.01	knowledge of types of cutting and heating tools and equipment such as gas and electric
1.04.02	knowledge of materials to be cut or heated
1.04.03	knowledge of cutting and heating consumable materials such as propane, oxygen and acetylene
1.04.04	knowledge of cutting and heating tools and equipment operating procedures
1.04.05	knowledge of ventilation requirements
1.04.06	ability to select cutting and heating tools and equipment
1.04.07	ability to perform cutting and heating procedures
1.04.08	ability to maintain cutting and heating tools and equipment
1.04.09	ability to recognize flammable materials
1.04.10	ability to identify unsafe cutting and heating equipment
1.04.11	ability to store cutting and heating equipment

Sub-task

1.05 Uses measuring tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.05.01	knowledge of types of measuring tools such as micrometers, dial indicators, calipers, telescopic gauges and feeler gauges
1.05.02	knowledge of operating procedures
1.05.03	knowledge of types of measurements such as volume, diameter, linear and pressure
1.05.04	ability to select measuring tools
1.05.05	ability to calibrate measuring tools
1.05.06	ability to interpret readings
1.05.07	ability to organize measuring tools
1.05.08	ability to maintain measuring tools
1.05.09	ability to perform calculations
1.05.10	ability to convert between imperial and metric
1.05.11	ability to store measuring tools

Sub-task

1.06 Uses shop equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.06.01	knowledge of types of shop equipment such as lifts, presses, pedestal grinders and drill presses
1.06.02	knowledge of operating procedures
1.06.03	ability to select shop equipment

1.06.04	ability to organize shop equipment
1.06.05	ability to recognize safe lifting locations or points
1.06.06	ability to recognize worn, damaged or defective shop equipment
1.06.07	ability to maintain shop equipment
1.06.08	ability to store shop equipment

Sub-task

1.07 Uses diagnostic and testing tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.07.01	knowledge of types of diagnostic and testing tools such as multimeters, compression gauges, vacuum gauges and computers
1.07.02	knowledge of operating procedures
1.07.03	ability to select diagnostic and testing tools
1.07.04	ability to calibrate diagnostic and testing tools
1.07.05	ability to interpret readings
1.07.06	ability to perform calculations
1.07.07	ability to convert between imperial and metric
1.07.08	ability to maintain diagnostic and testing tools
1.07.09	ability to store diagnostic and testing tools

Sub-task

1.08 Uses personal protective equipment (PPE) and safety equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

1.08.01	knowledge of types of PPE such as masks, glasses, coveralls and hearing protection
1.08.02	knowledge of types of safety equipment such as fire extinguisher, eye wash station and workplace mats
1.08.03	knowledge of PPE and safety equipment operations
1.08.04	knowledge of location of PPE and safety equipment
1.08.05	knowledge of workplace safety and health regulations
1.08.06	ability to select PPE and safety equipment
1.08.07	ability to inspect and maintain PPE and safety equipment
1.08.08	ability to store PPE and safety equipment

Task 2 Organizes work.

Sub-task

2.01 Communicates with others.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

2.01.01	knowledge of trade terminology
2.01.02	knowledge of verbal and written communication

2.01.03	ability to explain technical information in layperson's terms
2.01.04	ability to acquire information through questioning
2.01.05	ability to use communication equipment
2.01.06	ability to communicate with customers
2.01.07	ability to communicate with manufacturers and suppliers
2.01.08	ability to communicate with supervisors
2.01.09	ability to consult with colleagues
2.01.10	ability to communicate with other tradespeople such as welders, machinists and motor vehicle body repairers
2.01.11	ability to consult with authorities such as insurance appraisers and safety inspectors

Sub-task

2.02 Uses documentation and reference tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

2.02.01	knowledge of types of documentation such as service manuals, parts manuals, service bulletins and work orders
2.02.02	knowledge of formats of documentation and reference tools such as print, Internet, microfiche and CD-ROM
2.02.03	knowledge of Workplace Hazardous Materials Information System (WHMIS) documentation and symbols
2.02.04	ability to interpret and extract specific information

2.02.05	ability to draw technical sketches such as the routing of hoses, wires and cables
2.02.06	ability to complete work-related records such as work orders and service reports

Sub-task

2.03 Maintains safe work environment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

2.03.01	knowledge of WHMIS
2.03.02	knowledge of workers' rights and responsibilities
2.03.03	knowledge of company safety policies and procedures
2.03.04	knowledge of safety training requirements
2.03.05	knowledge of jurisdictional health and safety acts and regulations
2.03.06	knowledge of emergency procedures
2.03.07	knowledge of on-site first aid stations
2.03.08	knowledge of disposal and recycling procedures
2.03.09	ability to apply WHMIS procedures
2.03.10	ability to interpret safety and environmental regulations
2.03.11	ability to recognize and prevent personal injury hazards

Task 3 Performs routine work practices.

Sub-task

3.01 Uses trade-related consumables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

3.01.01	knowledge of trade-related consumables such as glues, paint, fasteners, sandpaper, electrical supplies and bonding agents
3.01.02	knowledge of WHMIS
3.01.03	ability to select trade-related consumables
3.01.04	ability to store trade-related consumables
3.01.05	ability to dispose of trade-related consumables
3.01.06	ability to apply WHMIS procedures

Sub-task

3.02 Performs periodic maintenance.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

3.02.01	knowledge of manufacturers' maintenance schedules and procedures
3.02.02	ability to check settings such as tire pressure, brake freeplay, fastener torques and suspension preload
3.02.03	ability to change fluids and components such as oil, filters, sparkplugs, tires and brakes
3.02.04	ability to adjust and lubricate components such as chains, belts, cables and levers
3.02.05	ability to test ride motorcycle

Sub-task

3.03 Performs storage procedures. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

3.03.01	knowledge of manufacturers' recommended storage procedures
3.03.02	knowledge of duration of storage
3.03.03	ability to add fuel stabilizer
3.03.04	ability to drain fuel system
3.03.05	ability to unhook and remove battery
3.03.06	ability to apply protective coatings such as cylinder fogging, metal protectant and paint protectant
3.03.07	ability to bring motorcycle back into service after storage

Sub-task

3.04 Assembles new motorcycle. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

3.04.01	knowledge of manufacturers' uncrating and assembly procedures
3.04.02	knowledge of all motorcycle components
3.04.03	ability to check for shipping damage
3.04.04	ability to uncrate motorcycle
3.04.05	ability to verify serial numbers and model type
3.04.06	ability to determine extent of assembly required

3.04.07	ability to install and adjust required components
3.04.08	ability to remove protective coatings

Sub-task

3.05 Conducts pre-delivery inspection (PDI).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

3.05.01	knowledge of manufacturers' recommended procedures
3.05.02	ability to identify quality control problems and service bulletins
3.05.03	ability to perform duties on factory PDI checklist such as filling and checking fluids, servicing batteries and checking fastener torque settings
3.05.04	ability to test ride motorcycle

Sub-task

3.06 Conducts safety inspection.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

3.06.01	knowledge of jurisdictional safety inspection requirements
3.06.02	knowledge of company safety inspection requirements
3.06.03	knowledge of licensing requirements to perform safety inspection

3.06.04	ability to perform duties on safety inspection checklist such as checking component integrity and function
3.06.05	ability to test ride motorcycle

BLOCK B

CHASSIS AND SUSPENSION

Context: *The chassis links and supports a number of related motorcycle components to work with each other utilizing structural geometry. Motorcycles use various chassis structures and devices to support different configuration such as cruiser, sport and dirt. The suspension cushions and isolates the rider from the road surface irregularities; it is designed to permit controlled wheel movement over irregular surfaces.*

Trends: *There is an increase in the use of exotic materials such as blended alloys, carbon fibre, titanium, magnesium and ceramics. There is an increase in the use of combined components such as frames to carry gas, oil and coolant, swing arms to carry oil and air intake in the frame. There is an increased use of bolted frame assembly, hydro forming and electronically adjusted suspension, and an increased use of after-market upgrades such as fork emulators, frame sliders and speed sensitive steering dampers.*

Related Components: **Chassis:** frames (cradle, stamped, trellis, perimeter, backbone), swing arms (single sided, double sided, paralevers), steering dampers, battery boxes, crash guards, saddle bags, foot rests, steering heads (rake, trail, offset), side cars, oil tanks, fairings, shifters, rails, triple clamps, handle bars.

Suspension: front suspensions (telescopic, telelever, springer, leading link), nitrogen shocks, hydraulic and air shocks, air compressors, springs, linkages, damper rods.

Tools and Equipment: See Appendix A.

Task 4 **Diagnoses chassis.**

Sub-task

4.01 **Diagnoses frame.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

4.01.01 knowledge of types of frames and structures such as cradle, backbone, stamped and perimeter frames

4.01.02 knowledge of frame materials such as aluminum and steel

4.01.03	knowledge of steering geometry
4.01.04	knowledge of manufacturers' service limits
4.01.05	ability to perform sensory inspection
4.01.06	ability to evaluate component condition
4.01.07	ability to perform checks and measurements such as visual checks, alignment checks and pressure tests
4.01.08	ability to determine causes of failure such as impact and stress

Sub-task

4.02 Diagnoses steering head.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

4.02.01	knowledge of types of steering heads such as telelever, triple clamp and springer type
4.02.02	knowledge of steering head system components such as bearings, seals and races
4.02.03	knowledge of steering geometry
4.02.04	knowledge of system operation
4.02.05	knowledge of manufacturers' service limits
4.02.06	knowledge of diagnostic procedures
4.02.07	ability to perform sensory inspection
4.02.08	ability to evaluate component conditions such as notched bearings
4.02.09	ability to check adjustment and measure preload
4.02.10	ability to determine causes of failure such as stress, water damage and shock load

Sub-task

4.03 Diagnoses steering dampers.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

4.03.01	knowledge of types of steering dampers such as rotary, friction and hydraulic
4.03.02	knowledge of steering damper components such as discs, seals, fluids and valves
4.03.03	knowledge of system operation
4.03.04	knowledge of manufacturers' service limits
4.03.05	knowledge of diagnostic procedures
4.03.06	ability to perform sensory inspection
4.03.07	ability to evaluate component conditions such as seal leakage, excessive play and binding
4.03.08	ability to perform checks and measurements such as bore diameter, clearances, thickness and tension
4.03.09	ability to determine the causes of failure such as leakage and physical damage

Sub-task

4.04 Diagnoses handle bars and controls.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

4.04.01	knowledge of types of handle bars such as beams, tubular and clip-on
4.04.02	knowledge of control system components such as clutch lever, brake lever, switchgear, twist grip and thumb lever

4.04.03	knowledge of materials such as aluminum, plastic and rubber
4.04.04	knowledge of system operation
4.04.05	knowledge of manufacturers' service limits
4.04.06	knowledge of diagnostic procedures
4.04.07	ability to perform sensory inspection
4.04.08	ability to evaluate component conditions such as broken cables, and bent/broken handlebars and levers
4.04.09	ability to perform checks and measurements for misalignment, excessive play and binding
4.04.10	ability to determine causes of failure

Sub-task

4.05 Diagnoses foot rest and controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

4.05.01	knowledge of types of control systems such as foot rests, shifter and brake pedal
4.05.02	knowledge of system components such as bushings, linkages and springs
4.05.03	knowledge of system operation
4.05.04	knowledge of manufacturers' service limits
4.05.05	knowledge of diagnostic procedures
4.05.06	ability to perform sensory inspection
4.05.07	ability to perform checks and measurements for excessive play, misalignment, wear and tear, and seizure
4.05.08	ability to determine causes of failure

Sub-task

4.06 Diagnoses ancillary and accessory components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

4.06.01	knowledge of ancillary components such as centre/side stands, battery box and engine guards
4.06.02	knowledge of accessory components such as saddlebags, back rests and side cars
4.06.03	knowledge of system materials such as aluminum, plastic and steel
4.06.04	knowledge of manufacturers' service limits
4.06.05	knowledge of diagnostic procedures
4.06.06	ability to perform sensory inspection
4.06.07	ability to evaluate component conditions for rust, seizure and misalignment
4.06.08	ability to perform checks and measurements such as side car alignment and attachment
4.06.09	ability to determine the causes of failure

Task 5 Services chassis and components.

Sub-task

5.01 Services frame.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

5.01.01	knowledge of types of frames and structures such as cradle, backbone, stamped and perimeter frames

5.01.02	knowledge of frame materials such as aluminum and steel
5.01.03	knowledge of steering geometry
5.01.04	ability to remove and replace bearings, races, bushings and seals
5.01.05	ability to grease bearings, races, bushings and seals
5.01.06	ability to set tolerances within manufacturers' specifications

Sub-task

5.02 Services steering head.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

5.02.01	knowledge of types of steering heads such as telelever, triple clamp and springer type
5.02.02	knowledge of steering head system components such as bearings, seals and races
5.02.03	knowledge of materials such as brass, steel and aluminum
5.02.04	knowledge of steering geometry
5.02.05	knowledge of system operation
5.02.06	knowledge of manufacturers' service limits and procedures
5.02.07	ability to remove and replace bearing, races and seals
5.02.08	ability to grease bearings, races, bushings and seals
5.02.09	ability to set tolerances within manufacturers' specifications

Sub-task

5.03 Services steering dampers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

5.03.01	knowledge of types of steering dampers such as rotary, friction and hydraulic
5.03.02	knowledge of steering damper components such as discs, seals, fluids and valves
5.03.03	knowledge of system operation
5.03.04	knowledge of manufacturers' service limits and procedures
5.03.05	ability to remove and replace components
5.03.06	ability to rebuild steering dampers
5.03.07	ability to set tolerances within manufacturers' specifications

Sub-task

5.04 Services handle bars and controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

5.04.01	knowledge of types of handle bars such as beams, tubular and clip-on
5.04.02	knowledge of control system components such as clutch lever, brake lever, switchgear, twist grip and thumb lever
5.04.03	knowledge of materials such as aluminum, plastic and rubber
5.04.04	knowledge of system operation
5.04.05	knowledge of manufacturers' service limits and procedures

5.04.06	ability to remove and replace components such as levers, cables, grips and clamps
5.04.07	ability to perform reconditioning such as lubricating cables and pivots, repairing threads and bonding grips
5.04.08	ability to set tolerances within manufacturers' specifications

Sub-task

5.05 Services foot rests and controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

5.05.01	knowledge of types of control systems such as foot rests, shifter and brake pedal
5.05.02	knowledge of system components such as bushings, linkages and springs
5.05.03	knowledge of system operation
5.05.04	knowledge of manufacturers' service limits and procedures
5.05.05	ability to remove and replace components
5.05.06	ability to recondition components such as pivots, threads and pins
5.05.07	ability to set tolerances within manufacturers' specifications

Sub-task

5.06 Services ancillary and accessory components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

5.06.01 knowledge of ancillary components such as centre/side stands, battery box and engine guards

5.06.02 knowledge of accessory components such as saddlebags, back rests and side cars

5.06.03 knowledge of system materials such as aluminum, plastic and steel

5.06.04 knowledge of manufacturers' service limits and procedures

5.06.05 ability to remove and replace components

5.06.06 ability to recondition components such as threads, bushings, rubber mounts and latchings

5.06.07 ability to set tolerances within manufacturers' specifications

Task 6 Diagnoses suspension.

Sub-task

6.01 Diagnoses front suspension components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

6.01.01 knowledge of front suspension systems such as springer, telelever, telescopic (conventional and cartridge) and leading link types

6.01.02	knowledge of front suspension system components such as air fittings, bushings, seals, springs and valves
6.01.03	knowledge of materials such as copper, brass and plastic
6.01.04	knowledge of steering geometry
6.01.05	knowledge of system operation
6.01.06	knowledge of manufacturers' service limits
6.01.07	knowledge of diagnostic procedures
6.01.08	ability to perform sensory inspection
6.01.09	ability to evaluate component conditions such as bent, seized, leaking and binding
6.01.10	ability to perform checks and measurements such as fluid levels, spring sag, excessive play and steering geometry (rake, trail, offset)
6.01.11	ability to determine the causes of failure

Sub-task

6.02 Diagnoses rear suspension components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

6.02.01	knowledge of types of rear suspension systems such as single shock, twin shock, air shock, gas charged and hydraulic
6.02.02	knowledge of rear suspension system components such as linkages, seals, bladders and springs
6.02.03	knowledge of materials such as copper, brass, bronze, steel and plastic
6.02.04	knowledge of steering geometry
6.02.05	knowledge of system operation

6.02.06	knowledge of manufacturers' service limits
6.02.07	knowledge of diagnostic procedures
6.02.08	ability to perform sensory inspection
6.02.09	ability to evaluate component conditions such as bent, seized, leaking and binding
6.02.10	ability to perform checks and measurements such as excessive play, fluid levels and pressure
6.02.11	ability to determine the causes of failure

Sub-task

6.03 Diagnoses swing arm. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

6.03.01	knowledge of types of systems such as single sided, double sided and paralever
6.03.02	knowledge of system components such as shock mounts, linkages and bearings
6.03.03	knowledge of materials such as bronze, brass, steel and plastic
6.03.04	knowledge of swing arm geometry
6.03.05	knowledge of system operation
6.03.06	knowledge of manufacturers' service limits
6.03.07	knowledge of diagnostic procedures
6.03.08	ability to perform sensory inspection
6.03.09	ability to evaluate component conditions for seizure, leaking and misalignment
6.03.10	ability to perform checks and measurements such as preload, clearance and pressure
6.03.11	ability to determine the causes of failure

Task 7 **Services suspension system.**

Sub-task

7.01 **Services front suspension components.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

7.01.01	knowledge of front suspension systems such as springer, telelever, telescopic (conventional and cartridge) and leading link types
7.01.02	knowledge of front suspension system components such as air fittings, bushings, seals, springs and valves
7.01.03	knowledge of materials such as copper, brass and plastic
7.01.04	knowledge of steering geometry
7.01.05	knowledge of system operation
7.01.06	knowledge of manufacturers' service limits and procedures
7.01.07	ability to remove and replace components such as wheel, fender, seals and bushings
7.01.08	ability to recondition components
7.01.09	ability to set tolerances within manufacturers' specifications

Sub-task

7.02 Services rear suspension components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

7.02.01	knowledge of types of rear suspension systems such as single shock, twin shock, air shock, gas charged and hydraulic
7.02.02	knowledge of rear suspension system components such as linkages, seals, bladders and springs
7.02.03	knowledge of materials such as copper, brass, bronze, steel and plastic
7.02.04	knowledge of swing arm geometry
7.02.05	knowledge of system operation
7.02.06	knowledge of manufacturers' service limits and procedures
7.02.07	ability to remove and replace components such as bushings, shafts and bladders
7.02.08	ability to recharge shocks
7.02.09	ability to set tolerances within manufacturers' specifications

Sub-task

7.03 Services swing arm.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

7.03.01	knowledge of types of systems such as single sided, double sided and paralever
7.03.02	knowledge of system components such as shock mounts, linkages and bearings

7.03.03	knowledge of materials such as bronze, brass, steel and plastic
7.03.04	knowledge of swing arm geometry
7.03.05	knowledge of system operation
7.03.06	knowledge of manufacturers' service limits and procedures
7.03.07	ability to remove and replace components such as mounts, spacers and bushings
7.03.08	ability to recondition components such as threads, linkages and fittings

BLOCK C

WHEELS AND TIRES

Context: *Wheels and tires transfer steering and power delivery to the road. Different compounds and structures can deliver enhanced performance and/or mileage.*

Trends: *There is an increased use of advanced materials (alloys, carbon fibre) and exotic styles of wheels. Tires are becoming wider and lighter and last longer. There is a trend towards using nitrogen to inflate tires.*

Related Components: **Wheels:** rims, spokes, spoke nipples, hubs, bearings, spacers, seals, axles, dampers, Schraeder valves (valve stems).

Tires: tube, tubeless, bias ply, bias belted, radial.

Tools and Equipment: See Appendix A.

Task 8 Inspects wheels and tires.

Sub-task

8.01 Inspects tires.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

8.01.01	knowledge of types of tires such as bias ply, bias belted, radial, tube and tubeless
8.01.02	knowledge of components such as tire, tube and rim band
8.01.03	knowledge of materials such as rubber, nylon and aramid
8.01.04	knowledge of manufacturers' specifications such as speed ratings, load limits and recommended pressures
8.01.05	knowledge of diagnostic procedures
8.01.06	ability to perform sensory inspection
8.01.07	ability to inspect component conditions such as cracking, delaminating and cupping

8.01.08	ability to perform checks and measurements such as tread depth, pressure, balance and bead seal
8.01.09	ability to determine causes of failure such as overloading, over/under inflation and heavy torque/braking

Sub-task

8.02 Inspects spoked wheels. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

8.02.01	knowledge of types of spoked wheels such as tube and tubeless
8.02.02	knowledge of system components such as hub, rims, rim locks, spokes and spoke nipples
8.02.03	knowledge of materials such as aluminum and steel
8.02.04	knowledge of structure of spoked wheels
8.02.05	knowledge of manufacturers' service limits
8.02.06	knowledge of inspection procedures
8.02.07	ability to perform sensory inspection
8.02.08	ability to evaluate component conditions such as rusted, cracked, bent, loose/broken spokes and rims
8.02.09	ability to perform checks and measurements such as radial and lateral run out, preload and end play
8.02.10	ability to determine causes of failure such as impact, lack of maintenance and stress

Sub-task

8.03 Inspects solid wheels.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

8.03.01	knowledge of types of solid wheels such as cast, forged and machined
8.03.02	knowledge of components such as bearings, spacers, speedometer drive and cush drive
8.03.03	knowledge of materials such as alloys, steel and aluminum
8.03.04	knowledge of manufacturers' service limits
8.03.05	knowledge of inspection procedures
8.03.06	ability to perform sensory inspection
8.03.07	ability to evaluate component conditions such as damage, corrosion and blistering
8.03.08	ability to perform checks and measurements such as radial and lateral run out
8.03.09	ability to determine causes of failure

Sub-task

8.04 Inspects two-piece wheels.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

8.04.01	knowledge of two-piece wheel components such as rim halves, o-rings and valve stems
8.04.02	knowledge of stamped steel rims
8.04.03	knowledge of manufacturers' service limits
8.04.04	knowledge of inspection procedures
8.04.05	ability to perform sensory inspection

8.04.06	ability to evaluate component conditions such as rusted, bent and leaking
8.04.07	ability to perform checks and measurements such as pressure tests, and radial and lateral run out
8.04.08	ability to determine causes of failure such as deterioration of o-ring

Task 9 Services wheels and tires.

Sub-task

9.01 Services tires.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

9.01.01	knowledge of types of tires such as bias ply, bias belted, radial, tube and tubeless
9.01.02	knowledge of components such as tire, tube and rim band
9.01.03	knowledge of materials such as rubber, nylon and aramid
9.01.04	knowledge of manufacturers' service limits and procedures
9.01.05	knowledge of jurisdictional regulations for reconditioning tires
9.01.06	ability to remove and replace tires, tube and rim band
9.01.07	ability to recondition tires such as plugging and patching
9.01.08	ability to set tolerances to manufacturers' specifications
9.01.09	ability to correct causes of failure

Sub-task

9.02 Services spoked wheels. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

9.02.01	knowledge of types of spoked wheels such as tube and tubeless
9.02.02	knowledge of system components such as hubs, rims, rim locks, spokes and spoke nipples
9.02.03	knowledge of materials such as aluminum and steel
9.02.04	knowledge of structure of spoked wheels
9.02.05	knowledge of manufacturers' service limits and procedures
9.02.06	ability to remove and replace components such as spokes, rim locks, spoke nipples and valve stems
9.02.07	ability to recondition components such as bearings and seals
9.02.08	ability to set tolerances to manufacturers' specifications such as wheel truing
9.02.09	ability to correct causes of failure

Sub-task

9.03 Services solid wheels. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

9.03.01	knowledge of types of solid wheels such as cast, forged and machined
9.03.02	knowledge of components such as bearings, spacers, speedometer drive and cush drive

9.03.03	knowledge of materials such as alloys, steel and aluminum
9.03.04	knowledge of manufacturers' service limits and procedures
9.03.05	ability to remove and replace components such as bearings, races, valve stems and cush drives
9.03.06	ability to perform reconditioning such as balancing and repacking bearings
9.03.07	ability to set tolerances to manufacturers' specifications such as preload and end play
9.03.08	ability to correct causes of failure

Sub-task

9.04 Services two-piece wheels. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

9.04.01	knowledge of two-piece wheel components such as rim halves, o-rings and valve stems
9.04.02	knowledge of stamped steel rims
9.04.03	knowledge of manufacturers' service limits and procedures
9.04.04	ability to remove and replace o-rings, bearings and seals
9.04.05	ability to set tolerances to manufacturers' specifications such as run out and torque
9.04.06	ability to correct causes of failure

BLOCK D

BRAKES

Context: *Hydraulic braking systems are more efficient and have better braking power than mechanical systems. Mechanical systems are simpler and less expensive. Anti-lock braking systems (ABS) work with hydraulic systems to control imminent lock-up.*

Trends: *Braking systems have seen design improvements and advances in technology. There are more efficient friction materials and linked braking systems. ABS is becoming more integrated into motorcycles. Sprockets and discs are becoming integrated together. Perimeter rotor brakes are becoming more common in braking systems.*

Related Components: **Hydraulic:** discs, drums, master cylinder, slave cylinder, brake line, fittings, fluid (dot 3, dot 4, dot 5 and dot 5.1), proportioning valve, splitter, shoes and pads, pressure switches, springs, seals, torque arm.

Mechanical: discs, drums, shoes and pads, cables and adjusters, levers, cams, spindles, torque arm, backing plate, wheel cylinder, pivot pins, switches, springs, linkages.

Control systems: anti-dive, ABS, ECU, sensors, relays, proportioning valve, switches, brake line.

Tools and Equipment: See Appendix A.

Task 10 Diagnoses braking systems.

Sub-task

10.01 Diagnoses hydraulic braking systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

10.01.01 knowledge of hydraulic principles

10.01.02 knowledge of types of hydraulic braking systems such as disc and drum

10.01.03 knowledge of components such as master cylinder, brake line, caliper (slave cylinder), brake pads and fluids

10.01.04	knowledge of materials such as carbon, ceramics, aramid, metal sinter and organic compounds
10.01.05	knowledge of types of brake fluids
10.01.06	knowledge of system operation
10.01.07	knowledge of manufacturers' service limits
10.01.08	knowledge of diagnostic procedures
10.01.09	ability to perform sensory inspection
10.01.10	ability to evaluate component conditions such as fluid pressure, leakage, wear of brake pad and fluid quality
10.01.11	ability to perform checks and measurements such as run out, thickness and diameter
10.01.12	ability to determine causes of failure such as contaminants, abuse and inactivity
10.01.13	ability to test ride motorcycle

Sub-task

10.02 Diagnoses mechanical braking systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

10.02.01	knowledge of types of mechanical braking systems such as disc and drum
10.02.02	knowledge of components such as levers, cables, linkages, pivots and springs
10.02.03	knowledge of materials such as carbon, ceramics, aramid, metal sinter and organic compounds
10.02.04	knowledge of system operation
10.02.05	knowledge of manufacturers' service limits

10.02.06	knowledge of diagnostic procedures
10.02.07	ability to perform sensory inspection
10.02.08	ability to evaluate component conditions such as seizure and corrosion
10.02.09	ability to perform checks and measurements such as thickness, diameter and free play
10.02.10	ability to determine causes of failure such as contaminants and abuse
10.02.11	ability to test ride motorcycle

Sub-task

10.03 Diagnoses braking control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

10.03.01	knowledge of types of braking control systems such as ABS, integrated, linked and anti-dive
10.03.02	knowledge of components such as sensors, proportioning valves and pumps
10.03.03	knowledge of system operation
10.03.04	knowledge of manufacturers' service limits
10.03.05	knowledge of diagnostic procedures
10.03.06	ability to perform sensory inspection
10.03.07	ability to evaluate component conditions such as corrosion and faulty sensors
10.03.08	ability to perform checks and measurements such as leakage check and system function check
10.03.09	ability to determine causes of failure such as electrical failure and contaminants
10.03.10	ability to test ride motorcycle

Task 11 Services braking systems.

Sub-task

11.01 Services hydraulic braking systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

11.01.01	knowledge of hydraulic principles
11.01.02	knowledge of hydraulic braking system such as disc and drum
11.01.03	knowledge of components such as master cylinder, brake line, caliper (slave cylinder) and brake pads
11.01.04	knowledge of types of brake fluids
11.01.05	knowledge of materials such as carbon, ceramics, aramid, metal sinter and organic compounds
11.01.06	knowledge of system operation
11.01.07	knowledge of manufacturers' service limits and procedures
11.01.08	ability to remove and replace components such as friction materials, rotors, drums and springs
11.01.09	ability to recondition components such as master cylinder and slave cylinder
11.01.10	ability to set tolerances to manufacturers' specifications
11.01.11	ability to test ride motorcycle

Sub-task

11.02 Services mechanical braking systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

11.02.01	knowledge of types of mechanical braking systems such as disc and drum
11.02.02	knowledge of components such as levers, cables, linkages, pivots and springs
11.02.03	knowledge of materials such as carbon, ceramics, aramid, metal sinter and organic compounds
11.02.04	knowledge of system operation
11.02.05	knowledge of manufacturers' service limits and procedures
11.02.06	ability to remove and replace components such as pads, cables, pivots and drums
11.02.07	ability to recondition components such as pivots and cables
11.02.08	ability to set tolerances to manufacturers' specifications
11.02.09	ability to test ride motorcycle

Sub-task

11.03 Services braking control systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

11.03.01	knowledge of types of braking control systems such as ABS, integrated, linked and anti-dive

11.03.02	knowledge of components such as sensors, proportioning valves and pumps
11.03.03	knowledge of types of brake fluids
11.03.04	knowledge of system operation
11.03.05	knowledge of manufacturers' service limits and procedures
11.03.06	ability to remove and replace components such as sensors, control valves and relays
11.03.07	ability to recondition components such as secondary master cylinder, pistons and fittings
11.03.08	ability to set tolerances to manufacturers' specifications
11.03.09	ability to test ride motorcycle

BLOCK E

ENGINES

Context: *Motorcycle mechanics diagnose and service both four-stroke and two-stroke engines. Four-stroke engines are the most common, as they are quieter, more fuel efficient and more durable. Two-stroke engines are simpler in design and more common in scooters and off-road vehicles; they require a fuel-oil mixture and tend to have higher emissions.*

Trends: *There is a trend towards larger displacement and lighter components. Manufacturers' tolerances are tighter and engines have benefited from better engineering and design, better lubricants and new materials and technologies.*

Related Components: Cylinder head components, valve train components, cylinders, piston components, crankshaft assembly components, counterbalance assembly components, engine case components, lubrication system components, cooling system components.

Tools and Equipment: See Appendix A.

Task 12 Diagnoses four-stroke engines.

Sub-task

12.01 Diagnoses cylinder heads on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

12.01.01 knowledge of types of cylinder heads such as air or liquid cooled, and single or multi-valve

12.01.02 knowledge of cylinder head components such as valves, guides and seals

12.01.03 knowledge of cylinder head operation

12.01.04 knowledge of manufacturers' service limits

12.01.05 knowledge of diagnostic procedures

12.01.06 ability to perform sensory inspection

12.01.07	ability to evaluate component conditions such as cracking, warpage and leaks
12.01.08	ability to perform checks and measurements such as spring pressure, valve stem wear and valve sealing
12.01.09	ability to determine causes of failure

Sub-task

12.02 Diagnoses valve train on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

12.02.01	knowledge of types of valve trains such as overhead cam, push rod and desmodromic
12.02.02	knowledge of valve train components such as sprockets, gears, cams, rockers, chains and belts
12.02.03	knowledge of valve train operation
12.02.04	knowledge of manufacturers' service limits
12.02.05	knowledge of diagnostic procedures
12.02.06	ability to perform sensory inspection
12.02.07	ability to evaluate component conditions
12.02.08	ability to perform checks and measurements such as valve timing, valve lash, chain wear, gear wear and clearances
12.02.09	ability to determine causes of failure

Sub-task

12.03 Diagnoses cylinders and pistons on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

12.03.01	knowledge of types of cylinders such as air and liquid cooled
12.03.02	knowledge of piston components such as wrist pins, circlips and rings
12.03.03	knowledge of types of cylinder materials such as cast iron and plated
12.03.04	knowledge of types of pistons such as cast and forged
12.03.05	knowledge of cylinder and piston operation
12.03.06	knowledge of manufacturers' service limits
12.03.07	knowledge of diagnostic procedures
12.03.08	ability to perform sensory inspection
12.03.09	ability to evaluate component conditions such as leaks and wear
12.03.10	ability to perform checks and measurements such as out-of-round, ring end gap and piston-to-cylinder clearance
12.03.11	ability to determine causes of failure

Sub-task

12.04 Diagnoses crankshaft assembly on four-stroke engine.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

12.04.01	knowledge of types of crankshaft assemblies such as roller, plain bearing (shell bearing), forged and pressed
12.04.02	knowledge of crankshaft assembly components such as connecting rods, flywheels and thrust washers
12.04.03	knowledge of crankshaft assembly operation
12.04.04	knowledge of manufacturers' service limits
12.04.05	knowledge of diagnostic procedures
12.04.06	ability to perform sensory inspection
12.04.07	ability to evaluate component conditions
12.04.08	ability to perform checks and measurements such as crankshaft run out, bearing clearances and end play
12.04.09	ability to determine causes of failure

Sub-task

12.05 Diagnoses counterbalance assemblies on four-stroke engine.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

12.05.01	knowledge of types of counterbalance assemblies such as gear or chain driven, and single or multi-counterweights

12.05.02	knowledge of counterbalance assembly components such as gears, chains and bearings
12.05.03	knowledge of counterbalance operation
12.05.04	knowledge of manufacturers' service limits
12.05.05	knowledge of diagnostic procedures
12.05.06	ability to perform sensory inspection
12.05.07	ability to evaluate component conditions
12.05.08	ability to perform checks and measurements such as timing, lash, chain wear and bearing clearances
12.05.09	ability to determine causes of failure

Sub-task

12.06 Diagnoses engine cases on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

12.06.01	knowledge of types of engine cases such as single or multi-cylinder and vertical or horizontal split
12.06.02	knowledge of engine case components such as bearing bosses, covers and fasteners
12.06.03	knowledge of engine case operation
12.06.04	knowledge of manufacturers' service limits
12.06.05	knowledge of diagnostic procedures
12.06.06	ability to perform sensory inspection
12.06.07	ability to evaluate component conditions such as structural integrity, leaks and wear

12.06.08	ability to perform checks and measurements such as bearing clearances and fitment, mating surfaces, distortion and pressure testing
12.06.09	ability to determine causes of failure

Sub-task

12.07 Diagnoses lubrication system on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

12.07.01	knowledge of types of lubrication systems such as wet sump and dry sump
12.07.02	knowledge of lubrication system components such as pumps, reservoirs, filters, oil coolers and lines
12.07.03	knowledge of lubrication system operation
12.07.04	knowledge of manufacturers' service limits
12.07.05	knowledge of diagnostic procedures
12.07.06	ability to perform sensory inspection
12.07.07	ability to evaluate component conditions such as faulty oil pump, and worn gears and chains
12.07.08	ability to perform checks and measurements such as oil pressure, pump clearances and leakage
12.07.09	ability to determine causes of failure

Sub-task

12.08 Diagnoses cooling system on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

12.08.01	knowledge of types of cooling systems such as air and liquid (oil, coolant) cooled
12.08.02	knowledge of cooling system components such as pumps, lines, radiators, cooling fins and thermostats
12.08.03	knowledge of cooling system operation
12.08.04	knowledge of manufacturers' service limits
12.08.05	knowledge of diagnostic procedures
12.08.06	ability to perform sensory inspection
12.08.07	ability to evaluate component conditions such as deterioration and leaks
12.08.08	ability to perform checks and measurements such as coolant circulation and condition, pressure testing, and fan and thermostat operation
12.08.09	ability to determine causes of failure

Task 13 Services four-stroke engines.

Sub-task

13.01 Services cylinder heads on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.01.01	knowledge of types of cylinder heads such as air or liquid cooled, and single or multi-valve

13.01.02	knowledge of cylinder head components such as valves, guides and seals
13.01.03	knowledge of cylinder head operation
13.01.04	knowledge of manufacturers' service limits and procedures
13.01.05	ability to remove and replace components
13.01.06	ability to recondition components such as valves, seats and guides
13.01.07	ability to correct causes of failure
13.01.08	ability to set tolerances within manufacturers' specifications

Sub-task

13.02 Services valve train on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.02.01	knowledge of types of valve trains such as overhead cam, push rod and desmodromic
13.02.02	knowledge of valve train components such as sprockets, gears, cams, rockers, chains and belts
13.02.03	knowledge of valve train operation
13.02.04	knowledge of manufacturers' service limits and procedures
13.02.05	ability to remove and replace components
13.02.06	ability to recondition components such as rocker arms and valves
13.02.07	ability to correct causes of failure
13.02.08	ability to set tolerances within manufacturers' specifications

Sub-task

13.03 Services cylinders and pistons on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.03.01 knowledge of types of cylinders such as air and liquid cooled

13.03.02 knowledge of piston components such as wrist pins, circlips and rings

13.03.03 knowledge of types of cylinder materials such as cast iron and plated

13.03.04 knowledge of types of pistons such as cast and forged

13.03.05 knowledge of cylinder and piston operation

13.03.06 knowledge of manufacturers' service limits and procedures

13.03.07 ability to remove and replace components

13.03.08 ability to perform reconditioning such as reboring, sleeving and honing

13.03.09 ability to correct causes of failure

13.03.10 ability to set tolerances within manufacturers' specifications

Sub-task

13.04 Services crankshaft assembly on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.04.01 knowledge of types of crankshaft assemblies such as roller, plain bearing (shell bearing), forged and pressed

13.04.02	knowledge of crankshaft assembly components such as connecting rods, flywheels and thrust washers
13.04.03	knowledge of crankshaft assembly operation
13.04.04	knowledge of manufacturers' service limits and procedures
13.04.05	ability to remove and replace components
13.04.06	ability to perform reconditioning such as crankshaft truing and aligning
13.04.07	ability to correct causes of failure
13.04.08	ability to set tolerances within manufacturers' specifications

Sub-task

13.05 Services counterbalance assemblies on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.05.01	knowledge of types of counterbalance assemblies such as gear or chain driven, and single or multi-counterweights
13.05.02	knowledge of counterbalance assembly components such as gears, chains and bearings
13.05.03	knowledge of counterbalance operation
13.05.04	knowledge of manufacturers' service limits and procedures
13.05.05	ability to remove and replace components
13.05.06	ability to correct causes of failure
13.05.07	ability to set tolerances within manufacturers' specifications

Sub-task

13.06 Services engine cases on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.06.01 knowledge of types of engine cases such as single or multi-cylinder and vertical or horizontal split

13.06.02 knowledge of engine case components such as bearing bosses, covers and fasteners

13.06.03 knowledge of engine case operation

13.06.04 knowledge of manufacturers' service limits and procedures

13.06.05 ability to remove and replace components

13.06.06 ability to perform reconditioning such as refinishing mating surfaces and repairing threads

13.06.07 ability to correct causes of failure

13.06.08 ability to set tolerances within manufacturers' specifications

Sub-task

13.07 Services lubrication system on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.07.01 knowledge of types of lubrication systems such as wet sump and dry sump

13.07.02 knowledge of lubrication system components such as pumps, reservoirs, filters, oil coolers and lines

13.07.03 knowledge of lubrication system operation

13.07.04	knowledge of manufacturers' service limits and procedures
13.07.05	ability to remove and replace components
13.07.06	ability to recondition components such as check valves and oil galleries
13.07.07	ability to correct causes of failure
13.07.08	ability to set tolerances within manufacturers' specifications

Sub-task

13.08 Services cooling system on four-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

13.08.01	knowledge of types of cooling systems such as air and liquid-cooled
13.08.02	knowledge of cooling system components such as pumps, lines, radiators, cooling fins and thermostat
13.08.03	knowledge of cooling system operation
13.08.04	knowledge of manufacturers' service limits and procedures
13.08.05	ability to remove and replace components
13.08.06	ability to perform reconditioning such as soldering radiator and repairing threads
13.08.07	ability to correct causes of failure
13.08.08	ability to set tolerances within manufacturers' specifications

Task 14 Diagnoses two-stroke engines.

Sub-task

14.01 Diagnoses cylinder heads on two-stroke engine.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

14.01.01	knowledge of types of cylinder heads such as air and liquid-cooled
14.01.02	knowledge of cylinder head components such as decompressor and spark plugs
14.01.03	knowledge of cylinder head operation
14.01.04	knowledge of manufacturers' service limits
14.01.05	knowledge of diagnostic procedures
14.01.06	ability to perform sensory inspection
14.01.07	ability to evaluate component conditions such as carbon build-up, broken fasteners, failed gaskets and cracks
14.01.08	ability to perform checks such as checking for warpage and pressure
14.01.09	ability to determine causes of failure

Sub-task

14.02 Diagnoses valve system on two-stroke engine.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

14.02.01	knowledge of types of valve systems such as reed valve, rotary valve and piston port

14.02.02	knowledge of valve system components such as reeds, rotary valves and power valve actuators
14.02.03	knowledge of valve system operation
14.02.04	knowledge of manufacturers' service limits
14.02.05	knowledge of diagnostic procedures
14.02.06	ability to perform sensory inspection
14.02.07	ability to evaluate component conditions such as wear, damage and carbon build-up
14.02.08	ability to perform checks and measurements such as valve timing, valve operation and port timing
14.02.09	ability to determine causes of failure

Sub-task

14.03 Diagnoses cylinders (barrels) and pistons on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

14.03.01	knowledge of types of cylinders such as air and liquid-cooled
14.03.02	knowledge of types of cylinder materials such as cast iron and plated
14.03.03	knowledge of types of pistons such as cast and forged
14.03.04	knowledge of cylinder and piston components such as wrist pins, circlips and rings
14.03.05	knowledge of cylinder and piston operation
14.03.06	knowledge of manufacturers' service limits
14.03.07	knowledge of diagnostic procedures

14.03.08	ability to perform sensory inspection
14.03.09	ability to evaluate component conditions such as leaks and wear
14.03.10	ability to perform checks and measurements such as out-of-round, ring end gap, piston-to-cylinder clearance, port chamfers and ring index
14.03.11	ability to determine causes of failure

Sub-task

14.04 Diagnoses crankshaft assembly on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

14.04.01	knowledge of types of crankshaft assemblies such as single and multi-cylinder
14.04.02	knowledge of crankshaft assembly components such as connecting rods, labyrinth seals, flywheels, thrust washers and wrist pin bearings
14.04.03	knowledge of function of multi-cylinder crank seals
14.04.04	knowledge of crankshaft assembly operation
14.04.05	knowledge of manufacturers' service limits
14.04.06	knowledge of diagnostic procedures
14.04.07	ability to perform sensory inspection
14.04.08	ability to evaluate component conditions such as air leaks and wear

14.04.09	ability to perform checks and measurements such as indexing of multi-throw crank, pressure check, end play and bearing clearances
14.04.10	ability to determine causes of failure

Sub-task

14.05 Diagnoses engine cases on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

14.05.01	knowledge of types of engine cases such as single or multi-cylinder, and vertical or horizontal split
14.05.02	knowledge of engine case components such as bearing bosses, covers, case seals and fasteners
14.05.03	knowledge of engine case operation
14.05.04	knowledge of manufacturers' service limits
14.05.05	knowledge of diagnostic procedures
14.05.06	ability to perform sensory inspection
14.05.07	ability to evaluate component conditions such as structural integrity, leaks, warped mating surfaces and wear
14.05.08	ability to perform checks and measurements such as pressure and vacuum testing, bearing clearance and fitment, and distortion
14.05.09	ability to determine causes of failure

Sub-task

14.06 Diagnoses lubrication system on two-stroke engine.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

14.06.01	knowledge of types of lubrication systems such as pre-mix, intake injection and positive bearing injection
14.06.02	knowledge of lubrication system components such as oil injection pump, oil tank and lines
14.06.03	knowledge of lubrication system operation
14.06.04	knowledge of manufacturers' service limits
14.06.05	knowledge of diagnostic procedures
14.06.06	ability to perform sensory inspection
14.06.07	ability to evaluate component conditions such as faulty oil pump, clogged lines and incorrect oil/fuel ratio
14.06.08	ability to perform checks and measurements such as synchronization and volume check
14.06.09	ability to determine causes of failure

Sub-task

14.07 Diagnoses cooling system on two-stroke engine.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

14.07.01	knowledge of types of cooling systems such as liquid and air-cooled
14.07.02	knowledge of cooling system components such as pumps, lines, radiators, cooling fins and thermostats

14.07.03	knowledge of cooling system operation
14.07.04	knowledge of manufacturers' service limits
14.07.05	knowledge of diagnostic procedures
14.07.06	ability to perform sensory inspection
14.07.07	ability to evaluate component conditions such as deterioration and leaks
14.07.08	ability to perform checks and measurements such as coolant circulation and condition, pressure testing, and fan and thermostat operation
14.07.09	ability to determine causes of failure

Task 15 Services two-stroke engines.

Sub-task

15.01 Services cylinder heads on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.01.01	knowledge of types of cylinder heads such as air or liquid-cooled
15.01.02	knowledge of cylinder head components such as decompressor and spark plugs
15.01.03	knowledge of cylinder head operation
15.01.04	knowledge of manufacturers' service limits and procedures
15.01.05	ability to remove and replace components
15.01.06	ability to perform reconditioning such as decarbonization and machining

15.01.07	ability to correct causes of failure
15.01.08	ability to set tolerances within manufacturers' specifications

Sub-task

15.02 Services valve system on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.02.01	knowledge of types of valve systems such as reed valve, rotary valve and piston port
15.02.02	knowledge of valve system components such as reeds, rotary valves and power valve actuators
15.02.03	knowledge of valve system operation
15.02.04	knowledge of manufacturers' service limits and procedures
15.02.05	ability to remove and replace components
15.02.06	ability to perform reconditioning such as decarbonization and rethreading
15.02.07	ability to correct causes of failure
15.02.08	ability to set tolerances within manufacturers' specifications

Sub-task

15.03 Services cylinders and pistons on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.03.01	knowledge of types of cylinders such as air and liquid-cooled

15.03.02	knowledge of types of cylinder materials such as cast iron and plated
15.03.03	knowledge of types of pistons such as cast and forged
15.03.04	knowledge of cylinder and piston operation
15.03.05	knowledge of manufacturers' service limits and procedures
15.03.06	ability to remove and replace components
15.03.07	ability to perform reconditioning such as boring, honing and chamfering
15.03.08	ability to correct causes of failure
15.03.09	ability to set tolerances within manufacturers' specifications

Sub-task

15.04 Services crankshaft assembly on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.04.01	knowledge of types of crankshaft assemblies such as single and multi-cylinder
15.04.02	knowledge of crankshaft assembly components such as connecting rods, labyrinth seals, flywheels, thrust washers and wrist pin bearings
15.04.03	knowledge of crankshaft operation
15.04.04	knowledge of manufacturers' service limits and procedures
15.04.05	ability to remove and replace components
15.04.06	ability to perform reconditioning such as truing and aligning

15.04.07	ability to correct causes of failure
15.04.08	ability to set tolerances within manufacturers' specifications

Sub-task

15.05 Services engine cases on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.05.01	knowledge of types of engine cases such as single or multi-cylinder, and vertical or horizontal split
15.05.02	knowledge of engine case components such as bearing bosses, covers, case seals and fasteners
15.05.03	knowledge of engine case operation
15.05.04	knowledge of manufacturers' service limits and procedures
15.05.05	ability to remove and replace components
15.05.06	ability to perform reconditioning such as sleeving and lapping mating surfaces
15.05.07	ability to correct causes of failure
15.05.08	ability to set tolerances within manufacturers' specifications

Sub-task

15.06 Services lubrication system on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.06.01	knowledge of types of lubrication systems such as pre-mix, intake injection and positive bearing injection
15.06.02	knowledge of lubrication system components such as oil injection pump, oil tank and lines
15.06.03	knowledge of lubrication system operation
15.06.04	knowledge of manufacturers' service limits and procedures
15.06.05	ability to remove and replace components
15.06.06	ability to correct causes of failure
15.06.07	ability to set tolerances within manufacturers' specifications

Sub-task

15.07 Services cooling system on two-stroke engine.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

15.07.01	knowledge of types of cooling systems such as liquid and air-cooled
15.07.02	knowledge of cooling system components such as pumps, lines, radiators, cooling fins and thermostats
15.07.03	knowledge of cooling system operation
15.07.04	knowledge of manufacturers' service limits and procedures

15.07.05	ability to remove and replace components
15.07.06	ability to perform reconditioning such as soldering radiator and repairing threads
15.07.07	ability to correct causes of failure
15.07.08	ability to set tolerances within manufacturers' specifications

BLOCK F

POWER TRANSFER

Context: *Power transfer covers all components involved in the transmission of power from the crankshaft to the rear wheel.*

Trends: *There is an increase in the use of new fibres such as aramid and carbon fibers. Improvements in technology and materials have led to an increase in the popularity of automatic transmissions, electronic shifting and fluid drive systems that are being driven by new materials that make power transfer systems lighter, more compact and more suitable for motorcycles. There is a revival in the use of "back torque slipper" clutches due to an increase in engine output.*

Related Components: Engine sprockets, clutch bearings, clutch plates, clutch baskets, clutch springs, clutch release mechanism, ring gear, chain, chain tensioner, pulleys, sprockets, main shaft, driven/output shaft, pinion gears, wheel gears, shift drum, shift forks, gear shift linkage, seals, bearings, ECU, sheave assemblies (primary and secondary), helix gear, rollers, shims, springs, valve body, torque converter, belts (cog and V), middle drive gears, middle driven gears, drive shaft, universal joint, gear housing, drive plate, drive coupling, driven plates, clutch hub.

Tools and Equipment: See Appendix A.

Task 16 Diagnoses clutches and primary drive.

Sub-task

16.01 Diagnoses primary drive gears.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

16.01.01 knowledge of types of primary gear systems such as straight cut, helical cut and zero lash gear

16.01.02 knowledge of components such as drive gear and driven gear

16.01.03 knowledge of primary gear system operation

16.01.04 knowledge of diagnostic procedures

16.01.05 ability to perform sensory inspections

16.01.06	ability to evaluate component conditions such as cracks, pits and burrs
16.01.07	ability to perform checks and measurements
16.01.08	ability to identify causes of failure

Sub-task

16.02 Diagnoses primary drive chains and sprockets.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

16.02.01	knowledge of types of primary drive chain and sprocket systems such as roller and hy-vo (silent chain)
16.02.02	knowledge of primary drive chain and sprocket system operation
16.02.03	knowledge of components such as chain tensioners and sliders
16.02.04	knowledge of manufacturers' service limits
16.02.05	knowledge of diagnostic procedures
16.02.06	ability to perform sensory inspections
16.02.07	ability to evaluate component conditions such as sprocket wear, stretched chains and roller defects
16.02.08	ability to identify causes of failure

Sub-task

16.03 Diagnoses primary drive belts and pulleys.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

16.03.01	knowledge of belt handling procedures
16.03.02	knowledge of manufacturers' service limits
16.03.03	ability to perform sensory inspection
16.03.04	ability to evaluate component conditions such as belt separation and cracking, and worn pulleys

Sub-task

16.04 Diagnoses manual clutches.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

16.04.01	knowledge of types of manual clutches such as wet and dry
16.04.02	knowledge of manual clutch components such as springs, fibre plates and metal plates
16.04.03	knowledge of types of release mechanisms such as hydraulic, ramp and cable lever
16.04.04	knowledge of manual clutch operation
16.04.05	knowledge of manufacturers' service limits
16.04.06	knowledge of diagnostic procedures
16.04.07	ability to perform sensory inspection
16.04.08	ability to evaluate component conditions such as burnt, broken and worn

16.04.09	ability to perform checks and measurements such as plate thickness and warpage
16.04.10	ability to determine causes of failure

Sub-task

16.05 Diagnoses automatic clutches. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

16.05.01	knowledge of types of automatic clutches such as centrifugal, fluid and movable sheave
16.05.02	knowledge of automatic clutch components such as shoes, drums and springs
16.05.03	knowledge of automatic clutch operation
16.05.04	knowledge of manufacturers' service limits
16.05.05	knowledge of diagnostic procedures
16.05.06	ability to perform sensory inspection
16.05.07	ability to evaluate component conditions such as burnt materials, broken springs and wear
16.05.08	ability to perform checks and measurements
16.05.09	ability to determine causes of failure

Sub-task

16.06 Diagnoses kick start. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

16.06.01	knowledge of components such as kick shaft, ratcheting gear and spring
16.06.02	knowledge of kick start operation

16.06.03	knowledge of diagnostic procedures
16.06.04	ability to perform sensory inspection
16.06.05	ability to evaluate component conditions
16.06.06	ability to check damage to components such as shaft, bushings and gears
16.06.07	ability to determine causes of failure

Task 17 Services clutches and primary drives.

Sub-task

17.01 Services primary drive gears. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

17.01.01	knowledge of types of primary drive gears such as straight cut, helical cut and zero lash
17.01.02	knowledge of components such as drive gear and driven gear
17.01.03	knowledge of manufacturers' service limits and procedures
17.01.04	ability to remove and replace components
17.01.05	ability to correct the causes of failure

Sub-task

17.02 Services primary drive chains and sprockets.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

17.02.01	knowledge of types of primary drive chain and sprocket systems such as roller and hy-vo (silent chains)
17.02.02	knowledge of components such as chain tensioners and sliders
17.02.03	knowledge of manufacturers' service limits and procedures
17.02.04	knowledge of component failures such as breakage and damage
17.02.05	ability to remove, replace and adjust components such as chains, tensioners and sprockets within manufacturers' specifications
17.02.06	ability to correct causes of failure such as lack of lubrication and incorrect adjustment

Sub-task

17.03 Services primary drive belts and pulleys.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

17.03.01	knowledge of belt handling procedures
17.03.02	knowledge of components such as tensioners, belts and pulleys
17.03.03	knowledge of belt conditions requiring replacement such as separation, contamination and cracking
17.03.04	knowledge of manufacturers' service limits and procedures

17.03.05	ability to remove and replace components
17.03.06	ability to correct causes of failure such as spline wear on pulleys and shafts, misalignment and oil seal failure

Sub-task

17.04 Services manual clutches. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

17.04.01	knowledge of types of manual clutches such as wet and dry
17.04.02	knowledge of manual clutch components such as springs, fibre plates and metal plates
17.04.03	knowledge of types of release mechanisms such as hydraulic, ramp and cable lever
17.04.04	knowledge of manual clutch operation
17.04.05	knowledge of manufacturers' service limits and procedures
17.04.06	ability to remove and replace components
17.04.07	ability to measure thickness of clutch plates
17.04.08	ability to correct causes of failure

Sub-task

17.05 Services automatic clutches. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

17.05.01	knowledge of types of automatic clutches such as centrifugal, fluid and movable sheave
17.05.02	knowledge of automatic clutch components such as shoes, drums and springs

17.05.03	knowledge of automatic clutch operation
17.05.04	knowledge of manufacturers' service limits and procedures
17.05.05	ability to remove and replace components
17.05.06	ability to correct causes of failure such as lack of lubrication and incorrect adjustment

Sub-task

17.06 Services kick start. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

17.06.01	knowledge of kick start components such as shaft, ratcheting gear and spring
17.06.02	knowledge of kick start operation
17.06.03	knowledge of manufacturers' service limits and procedures
17.06.04	ability to remove and replace components
17.06.05	ability to perform adjustments such as spring tension and decompression cable adjustment
17.06.06	ability to correct causes of failure

Task 18 Diagnoses transmissions.

Sub-task

18.01 Diagnoses constant mesh transmissions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

18.01.01 knowledge of constant mesh transmission components such as shifter mechanisms, gears and shafts

18.01.02 knowledge of operation of constant mesh transmissions

18.01.03 knowledge of diagnostic procedures

18.01.04 ability to perform sensory inspection

18.01.05 ability to evaluate component conditions such as worn gears and bearings, and damaged shift forks

18.01.06 ability to perform measurements such as shaft end play, gear shimming and fork clearance

18.01.07 ability to determine causes of component or function failure

Sub-task

18.02 Diagnoses variable ratio belt transmissions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

18.02.01 knowledge of variable ratio belt transmission components such as v-belt, springs, rollers and sheaves

18.02.02 knowledge of variable ratio belt transmission operation

18.02.03	knowledge of manufacturers' service limits
18.02.04	knowledge of diagnostic procedures
18.02.05	ability to perform sensory inspection
18.02.06	ability to evaluate component conditions such as sticking sheaves, belt wear and sheave face grooving
18.02.07	ability to perform measurements such as belt width and spring free length
18.02.08	ability to determine causes of failure such as lack of maintenance and oil seal leak

Sub-task

18.03 Diagnoses automatic transmissions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

18.03.01	knowledge of types of automatic transmissions such as fluid drive and torque converter
18.03.02	knowledge of automatic transmission components such as drive pump, driven motor and pistons
18.03.03	knowledge of types of fluids used
18.03.04	knowledge of operation of automatic transmissions
18.03.05	knowledge of manufacturers' service limits
18.03.06	knowledge of diagnostic procedures
18.03.07	ability to perform sensory inspection
18.03.08	ability to evaluate component conditions such as pump wear and fluid deterioration

18.03.09	ability to perform measurements such as oil pressure and flow
18.03.10	ability to determine causes of failure such as lack of maintenance and contamination

Task 19 Services transmissions.

Sub-task

19.01 Services constant mesh transmissions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

19.01.01	knowledge of constant mesh transmission components such as shifter mechanism, gears and shafts
19.01.02	knowledge of operation of constant mesh transmissions
19.01.03	knowledge of manufacturers' service limits and procedures
19.01.04	ability to remove and replace components
19.01.05	ability to perform measurements such as shift fork clearance and shifter pawl adjustment
19.01.06	ability to correct causes of failure such as improper clutch adjustment, lack of lubrication and improper adjustment of final drive

Sub-task

19.02 Services variable ratio belt transmissions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

19.02.01	knowledge of variable ratio belt transmission components such as v-belt, springs, rollers and sheaves
19.02.02	knowledge of variable ratio belt transmission operation
19.02.03	knowledge of manufacturers' service limits and procedures
19.02.04	ability to remove and replace components
19.02.05	ability to deglaze sheave faces
19.02.06	ability to adjust sheave plate spacing
19.02.07	ability to correct causes of failure

Sub-task

19.03 Services automatic transmissions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

19.03.01	knowledge of automatic transmission components such as shifter mechanisms, gears and shafts
19.03.02	knowledge of manufacturers' service limits and procedures
19.03.03	ability to remove and replace components

19.03.04	ability to maintain a dust-free work environment
19.03.05	ability to correct causes of failure such as oil contamination and improper fluids

Task 20 Diagnoses final drive.

Sub-task

20.01 Diagnoses final drive chains and sprockets.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

20.01.01	knowledge of types of chains such as roller chain with seals and roller chain without seals
20.01.02	knowledge of operation of final drive chains and sprockets
20.01.03	knowledge of final drive ratio
20.01.04	knowledge of manufacturers' service limits
20.01.05	knowledge of diagnostic procedures
20.01.06	ability to perform sensory inspection
20.01.07	ability to evaluate component conditions such as sprocket wear, worn rollers and chain damage
20.01.08	ability to check chain deflection
20.01.09	ability to determine causes of failure such as overtightening, lack of lubrication and misalignment

Sub-task

20.02 Diagnoses final drive shaft and gears.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

20.02.01	knowledge of final drive shaft and gear components such as universal joints, bearings and seals
20.02.02	knowledge of operation of final drive shaft and gears
20.02.03	knowledge of manufacturers' service limits
20.02.04	knowledge of diagnostic procedures
20.02.05	ability to perform sensory inspection
20.02.06	ability to evaluate component conditions such as worn oil seal, chipped or cracked gears and worn bearings
20.02.07	ability to measure backlash of gear
20.02.08	ability to determine causes of failure such as leaking oil seal and incorrect lubricant

Sub-task

20.03 Diagnoses final drive belts and sprockets/pulleys.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

20.03.01	knowledge of components such as belts and sprockets/pulleys
20.03.02	knowledge of final drive sprocket/pulley ratios
20.03.03	knowledge of operation of final drive belts and sprockets/pulleys
20.03.04	knowledge of manufacturers' service limits

20.03.05	ability to perform sensory inspection
20.03.06	ability to evaluate component conditions such as wear of sprockets/pulleys and wear of belts
20.03.07	ability to determine causes of failure

Task 21 Services final drive.

Sub-task

21.01 Services final drive chains and sprockets.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

21.01.01	knowledge of types of chains such as roller chain with seals and roller chain without seals
21.01.02	knowledge of operation of final drive chains and sprockets
21.01.03	knowledge of final drive ratio
21.01.04	knowledge of manufacturers' service limits and procedures
21.01.05	ability to remove and replace components
21.01.06	ability to perform chain adjustment
21.01.07	ability to correct causes of failure such as overtightening, lack of lubrication and misalignment

Sub-task

21.02 Services final drive shaft and gears.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

21.02.01	knowledge of final drive shaft and gear components such as universal joints, bearings and seals
21.02.02	knowledge of operation of final drive shaft and gears
21.02.03	knowledge of manufacturers' service limits and procedures
21.02.04	ability to remove and replace components
21.02.05	ability to shim gear lash
21.02.06	ability to correct causes of failure such as leaking oil seal and incorrect lubricant

Sub-task

21.03 Services belts and sprockets/pulleys.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

21.03.01	knowledge of components such as belts and sprockets/pulleys
21.03.02	knowledge of operation of belt and sprocket/pulley drive
21.03.03	knowledge of drive sprocket/pulley ratios
21.03.04	knowledge of manufacturers' service limits and procedures
21.03.05	ability to remove and replace components
21.03.06	ability to adjust belt tension

21.03.07	ability to check alignment of sprockets/pulleys
21.03.08	ability to correct causes of failure

BLOCK G

ELECTRICAL SYSTEMS

Context: *Electrical systems include the starting system, charging system, ignition system, ancillaries and accessories.*

Trends: *There is an increase in the complexity of electronic components in motorcycles. Electronic (push button) shifting is becoming more popular. There is an increase in the use of integrated anti-theft systems, Global Positioning Systems (GPS) and air bag systems.*

Related Components: Battery, wiring harness, alternator assembly, regulator, solenoid, ECU, starter motor, ignition coils, transistor controlled ignition unit (TCI), pulser assembly, capacitor discharge ignition unit (CDI), meter assembly, cruise control unit, generator coils, switches, sensors, lights, horns, pickup coils, fuse box assembly, audio system, GPS, relays, fuel pump, cooling fan, thermo breaker, signal systems, high tension lead, circuit breaker, breaker points, condenser, system interlocks.

Tools and Equipment: See Appendix A.

Task 22 Diagnoses electrical systems.

Sub-task

22.01 Diagnoses battery and charging system.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

22.01.01 knowledge of types of batteries such as absorbed glass mat (AGM), lead acid and gel cell

22.01.02 knowledge of types of charging systems such as alternator and generator

22.01.03 knowledge of components of charging systems such as rotors, stators and regulator/rectifiers

22.01.04 knowledge of charging system operation

22.01.05 knowledge of manufacturers' service limits

22.01.06	ability to perform sensory inspection
22.01.07	ability to evaluate component conditions such as melted connectors and battery plate sulphation
22.01.08	ability to perform checks and measurements such as resistance, load testing and voltage output
22.01.09	ability to determine causes of failure

Sub-task

22.02 Diagnoses ignition system. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

22.02.01	knowledge of types of ignition systems such as CDI and TCI
22.02.02	knowledge of ignition system components such as pulsers, coils and CDI units
22.02.03	knowledge of ignition system operation
22.02.04	knowledge of diagnostic procedures
22.02.05	knowledge of manufacturers' service limits
22.02.06	ability to perform sensory inspection
22.02.07	ability to perform checks and measurements such as coil resistance, pulse voltage, air gap and source voltage
22.02.08	ability to determine causes of failure

Sub-task

22.03 Diagnoses starting system.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

22.03.01	knowledge of starting system components such as solenoids, starter drives/clutches and field coils
22.03.02	knowledge of starting system operation
22.03.03	knowledge of manufacturers' service limits
22.03.04	knowledge of diagnostic procedures
22.03.05	ability to perform sensory inspection
22.03.06	ability to evaluate component conditions such as burnt brushes, galled bearing surfaces and damaged starter gears
22.03.07	ability to perform checks and measurements
22.03.08	ability to determine causes of failure

Sub-task

22.04 Diagnoses ancillary and accessory components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

22.04.01	knowledge of ancillary components such as lights, horns and signal systems
22.04.02	knowledge of accessory components such as audio system, cruise control and security systems
22.04.03	knowledge of operation of ancillary and accessory components
22.04.04	knowledge of manufacturers' specifications such as operating voltage and resistance

22.04.05	ability to perform sensory inspection
22.04.06	ability to evaluate component conditions such as corrosion and damaged wiring connectors
22.04.07	ability to determine causes of failure

Task 23 Services electrical systems.

Sub-task

23.01 Services battery and charging system.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

23.01.01	knowledge of types of batteries such as AGM, lead acid and gel cell
23.01.02	knowledge of types of charging systems such as alternator and generator
23.01.03	knowledge of components of charging systems such as rotors, stators and regulators/rectifiers
23.01.04	knowledge of charging system operation
23.01.05	knowledge of manufacturers' service limits and procedures
23.01.06	knowledge of battery initialization, charging and maintenance procedures
23.01.07	ability to remove and replace components
23.01.08	ability to correct causes of failure

Sub-task

23.02 Services ignition system. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

23.02.01	knowledge of types of ignition systems such as CDI and TCI
23.02.02	knowledge of ignition system components such as pulsers, coils and CDI units
23.02.03	knowledge of ignition system operation
23.02.04	knowledge of manufacturers' service limits and procedures
23.02.05	ability to remove and replace components
23.02.06	ability to perform adjustments such as spark plug gap, dwell and pulse coil air gap
23.02.07	ability to correct causes of failure such as improper installation of battery and short circuit of wiring

Sub-task

23.03 Services starting system. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

23.03.01	knowledge of starting system components such as solenoids, starter drives/clutches and field coils
23.03.02	knowledge of starting system operation
23.03.03	knowledge of manufacturers' service limits and procedures
23.03.04	ability to remove and replace components
23.03.05	ability to recondition armatures

23.03.06	ability to perform measurements
23.03.07	ability to correct causes of failure

Sub-task

23.04 Services ancillary and accessory components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

23.04.01	knowledge of ancillary components such as lights, horns and signal systems
23.04.02	knowledge of accessory components such as audio systems, cruise control and security systems
23.04.03	knowledge of operation of ancillary and accessory components
23.04.04	knowledge of manufacturers' service limits and procedures
23.04.05	ability to remove and replace components
23.04.06	ability to recondition components such as switches, contacts and connectors
23.04.07	ability to adjust components such as horn and antenna
23.04.08	ability to correct causes of failure

BLOCK H

VEHICLE MANAGEMENT SYSTEMS

Context: *Vehicle management systems use the ECU to control the integration of many functions in the operation of the engine including fuel delivery, ignition timing, valve timing and exhaust emissions.*

Trends: *There is an increase in the use of advanced electrical components and materials (e.g. ceramics, composites). There is increased reliance on ECU.*

Related Components: ECU, sensors and relays, catalytic converter, charcoal canister, air injection system, exhaust variable valves.

Tools and Equipment: Hand tools, computer, manufacturer's specialized tools, exhaust gas analysis kit, electronic scanning meters, fuel pressure tester, injector tester.

Task 24 Diagnoses vehicle management systems.

Sub-task

24.01 Diagnoses emission systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

24.01.01	knowledge of emission system components such as catalytic converter, charcoal canister, O_2 sensor and air injection system
24.01.02	knowledge of emission system operation
24.01.03	knowledge of diagnostic procedures
24.01.04	ability to perform sensory inspection
24.01.05	ability to evaluate component conditions such as deteriorated hoses and saturation of charcoal filter
24.01.06	ability to perform measurements such as HC and CO content of exhaust gases and O_2 sensor voltage
24.01.07	ability to determine causes of failure

Sub-task

24.02 Diagnoses electronic control unit (ECU).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

24.02.01	knowledge of ECU components such as sensors, relays, fuel pumps and interlocks
24.02.02	knowledge of ECU operation
24.02.03	knowledge of manufacturers' outputs and test procedures
24.02.04	ability to perform manufacturers' test procedures
24.02.05	ability to evaluate component conditions such as loose wiring and plugged filters
24.02.06	ability to perform checks and measurements
24.02.07	ability to determine causes of failure

Task 25 Services vehicle management systems.

Sub-task

25.01 Services emission systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

25.01.01	knowledge of emission system components such as catalytic converter, charcoal canister, O_2 sensor and air injection system
25.01.02	knowledge of emission system operation
25.01.03	knowledge of manufacturers' service limits and procedures

25.01.04	ability to remove and replace components
25.01.05	ability to correct causes of failure such as adjusting fuel-to-air mixture

Sub-task

25.02 Services electronic control unit.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	no	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

25.02.01	knowledge of ECU components such as sensors, relays, fuel pumps and interlocks
25.02.02	knowledge of ECU operation
25.02.03	knowledge of manufacturers' service limits and procedures
25.02.04	ability to remove and replace ECU components
25.02.05	ability to perform initialization and adjustment of ECU
25.02.06	ability to correct causes of failure

BLOCK I

FUEL AND EXHAUST SYSTEMS

Context: *Fuel and exhaust systems are comprised of the fuel tank, air delivery system, carburetor, fuel injector, exhaust system and turbochargers. They introduce fuel and air into the engine to allow for combustion. The primary function of exhaust systems is to direct exhaust and lower noise emissions.*

Trends: *There are more advanced, computer controlled, fuel efficient, quieter intake and exhaust systems. There are more advanced disposable parts.*

Related Components: Fuel tanks and components, air delivery system components, carburetor components, fuel injection system components, exhaust system components, turbocharger components, air injection system components.

Tools and Equipment: See Appendix A.

Task 26 Diagnoses fuel and exhaust systems.

Sub-task

26.01 Diagnoses fuel tanks and components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

Supporting Knowledge & Abilities

26.01.01	knowledge of types of fuel tanks such as steel, aluminum and composite
26.01.02	knowledge of fuel tank components such as petcocks, pumps, valves, sending units and filler caps
26.01.03	knowledge of fuel tank operation
26.01.04	knowledge of manufacturers' service limits
26.01.05	knowledge of diagnostic procedures
26.01.06	ability to perform sensory inspection
26.01.07	ability to evaluate component conditions such as rust in tank, clogged filters and leaks

26.01.08	ability to perform checks and measurements such as pressure, volume, sending unit operation and vacuum operation
26.01.09	ability to determine causes of failure

Sub-task

26.02 Diagnoses air delivery system. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

26.02.01	knowledge of types of air delivery systems such as forced air induction and conventional air filtration
26.02.02	knowledge of air delivery system components such as air filter, air box and air sensors
26.02.03	knowledge of air delivery system operation
26.02.04	knowledge of manufacturers' service limits
26.02.05	knowledge of diagnostic procedures
26.02.06	ability to perform sensory inspection
26.02.07	ability to evaluate component conditions such as contamination, leaks and restrictions
26.02.08	ability to perform checks and measurements such as vacuum test and air flow test
26.02.09	ability to determine causes of failure

Sub-task

26.03 Diagnoses carburetor.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

26.03.01	knowledge of types of carburetors such as butterfly, constant velocity and mechanical slide
26.03.02	knowledge of carburetor components such as float, needle, seat, venturi and jets
26.03.03	knowledge of carburetor operation
26.03.04	knowledge of manufacturers' service limits
26.03.05	knowledge of diagnostic procedures
26.03.06	ability to perform sensory inspection
26.03.07	ability to evaluate component conditions such as plugged jets and contaminated fuel
26.03.08	ability to perform checks and measurements such as calibration, synchronization and float height
26.03.09	ability to determine causes of failure

Sub-task

26.04 Diagnoses fuel injection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

26.04.01	knowledge of types of fuel injection systems such as sequential and group
26.04.02	knowledge of fuel injection system components such as injectors, fuel rail, regulators and throttle body
26.04.03	knowledge of fuel injection system operation

26.04.04	knowledge of manufacturers' service limits
26.04.05	knowledge of diagnostic procedures
26.04.06	ability to perform sensory inspection
26.04.07	ability to evaluate component conditions such as clogged injectors, leaks and contaminated fuel
26.04.08	ability to perform checks and measurements such as pressure test, volume test and injector test
26.04.09	ability to determine causes of failure

Sub-task

26.05 Diagnoses exhaust system. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

26.05.01	knowledge of types of exhaust systems such as two-stroke and four-stroke
26.05.02	knowledge of exhaust system components such as muffler, spark arrestor, header pipe, expansion chamber, exhaust variable valve, catalytic converter and O_2 sensor
26.05.03	knowledge of air injection system operation
26.05.04	knowledge of exhaust system operation
26.05.05	knowledge of manufacturers' service limits
26.05.06	knowledge of diagnostic procedures
26.05.07	ability to perform sensory inspection
26.05.08	ability to evaluate component conditions such as restricted pipe and cracks

26.05.09	ability to perform checks and measurements such as exhaust gas analysis and exhaust control valve check
26.05.10	ability to determine causes of failure

Sub-task

26.06 Diagnoses turbochargers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

26.06.01	knowledge of turbocharger components such as wastegate, impellers, seals and bushings
26.06.02	knowledge of turbocharger operation
26.06.03	knowledge of manufacturers' service limits
26.06.04	knowledge of diagnostic procedures
26.06.05	ability to perform sensory inspection
26.06.06	ability to evaluate component conditions such as wastegate seizure and seal leaking
26.06.07	ability to perform checks and measurements such as impeller clearance, pressure test and vacuum test
26.06.08	ability to determine causes of failure

Task 27 Services fuel and exhaust systems.

Sub-task

27.01 Services fuel tanks and components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

27.01.01	knowledge of types of fuel tanks such as steel, aluminum and composite
27.01.02	knowledge of fuel tank components such as petcocks, pumps, valves, sending units and filler caps
27.01.03	knowledge of fuel tank operation
27.01.04	knowledge of manufacturers' service limits and procedures
27.01.05	ability to remove and replace components
27.01.06	ability to recondition components such as tanks, petcocks and filler caps
27.01.07	ability to correct causes of failure
27.01.08	ability to set tolerances within manufacturers' specifications

Sub-task

27.02 Services air delivery system.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

27.02.01	knowledge of types of air delivery systems such as forced air induction and conventional air filtration
27.02.02	knowledge of air delivery system components such as air filter, air box and air sensors

27.02.03	knowledge of air delivery system operation
27.02.04	knowledge of manufacturers' service limits and procedures
27.02.05	ability to remove and replace components
27.02.06	ability to recondition components such as air filter and seals
27.02.07	ability to correct causes of failure
27.02.08	ability to set tolerances within manufacturers' specifications

Sub-task

27.03 Services carburetor. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

27.03.01	knowledge of types of carburetors such as butterfly, constant velocity and mechanical slide
27.03.02	knowledge of carburetor components such as float, needle, seat, venturi and jets
27.03.03	knowledge of carburetor operation
27.03.04	knowledge of manufacturers' service limits and procedures
27.03.05	ability to remove and replace components
27.03.06	ability to recondition carburetor body
27.03.07	ability to correct causes of failure
27.03.08	ability to set tolerances within manufacturers' specifications

Sub-task

27.04 Services fuel injection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	yes	ND

27.04.01 knowledge of types of fuel injection systems such as sequential and group

27.04.02 knowledge of fuel injection system components such as injectors, fuel rail, regulators and throttle body

27.04.03 knowledge of fuel injection system operation

27.04.04 knowledge of manufacturers' service limits and procedures

27.04.05 ability to remove and replace components

27.04.06 ability to recondition components such as injectors and throttle body

27.04.07 ability to correct causes of failure

27.04.08 ability to set tolerances within manufacturers' specifications

Sub-task

27.05 Services exhaust system.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	no	ND

27.05.01 knowledge of types of exhaust systems such as two-stroke and four-stroke

27.05.02 knowledge of exhaust system components such as muffler, spark arrestor, header pipe, expansion chamber, exhaust variable valve, catalytic converter and O_2 sensor

27.05.03 knowledge of air injection system operation

27.05.04	knowledge of exhaust system operation
27.05.05	knowledge of manufacturers' service limits and procedures
27.05.06	ability to remove and replace components
27.05.07	ability to perform reconditioning such as repacking and decarbonizing
27.05.08	ability to correct causes of failure
27.05.09	ability to set tolerances within manufacturers' specifications

Sub-task

27.06 Services turbochargers. **Supporting Knowledge & Abilities**

(NOT COMMON CORE)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	yes	no	ND	no	ND

27.06.01	knowledge of turbocharger components such as wastegate, impellers, seals and bushings
27.06.02	knowledge of turbocharger operation
27.06.03	knowledge of manufacturers' service limits and procedures
27.06.04	ability to remove and replace components
27.06.05	ability to recondition components such as wastegate, bushings and seals
27.06.06	ability to correct causes of failure
27.06.07	ability to set tolerances within manufacturers' specifications

APPENDICES

TOOLS AND EQUIPMENT

Hand Tools

Allen wrenches
ball hone
bearing driver
bearing puller
brass mallet
bushing and seal driver
bushing and seal driver
circlip pliers
combination wrench set
crimping tool
cylinder hone
dead-blow hammer
drill
file
heel and hammer
hone
lock wrench
mallet lever
pin/hook wrench
pliers
plug socket
probe
punch
reamers
riveting tool
rubber mallet
screwdriver
seal driver
slide hammer
snap ring pliers
socket
spanner wrench
spoke wrench
tensioner socket
threaded insert
tire iron
torque plates
torx wrench
valve seat cutter
valve seat cutter
wire brush
wire connector
wire cutting tool
wire stripping tool
wire wheel brush

Cutting/Heating Tools and Equipment

electric arc welding equipment
heat gun
oxyacetylene welding
and cutting equipment
propane torch
soldering equipment

Pneumatic and Electric Power Tools

bonding equipment
compressed air gun
glass bead blaster
grinder
hydraulic jack
hydraulic press
impact driver
impact tool
riveting equipment
rotary tool
spring shock compressor
valve spring compressor

Measuring Devices

air pressure gauge
alignment tool
ball gauge
boring bar
caliper
carburetor float level gauge
coolant tester
cylinder bore gauge
degree wheel
dial indicator
engine tachometer
feeler gauge
graduated cylinder
height gauge
hydrometer
inclinometer
inside micrometer
inside/outside calipers
micrometer
multimeter
oil pressure gauge
plastigage
pounds pull gauge
protractor (magnetic)
steel rule
straightedge
straightedge gauge
tape measure
telescopic gauge
tension gauge
thickness gauge
tire pressure gauge
torque wrench
tread depth gauge
vacuum gauge
vernier caliper

Diagnostic and Testing Tools

alignment tool
borescope
coil tester
compression tester
crankcase pressure test equipment
hydrometer
leak-down tester
load tester
multimeter
pressure tester
stethoscope
test light
timing light
vacuum gauge
vacuum pump

Shop Tools and Equipment

alignment bars
battery charger
bearing installation tool
bench grinder
bleeding equipment
brake cylinder hone
brake lathe
cable lubber
carbon scraper
chain breaker
computer diagnostic equipment
crank aligning jig
crank installer
crankcase separator
crankshaft puller
cylinder hone
damper rod holder
dynometer
electrical termination tool
electronic diagnostic equipment
frame jig
gasket remover
gasket scraper
grinder
guide installation pilot
hand pump
headlight aiming equipment
honing stone
line lap
magnetic base
metal lathe
nitrogen recharging unit
paint checker
parallel bars

Shop Tools and Equipment (continued)

piston pin puller
ring compressor
rotary drive shaft puller
scraper
seal driver
seal installer
seal remover
tire balancing equipment
tire machine
tire mounting equipment
truing jack
valve resurfacing tool
V-block
vice
water bath
wheel balancing equipment
wheel jig
wheel truing jig

GLOSSARY

accessory — an item added to a complete motorcycle, to enhance the visual or riding enjoyment of the motorcycle such as an audio system or a carrying rack

ancillary — an item fitted to the motorcycle at manufacture to enable or improve the function of the motorcycle

brake shoe — a cast aluminum, half-circular shoe that holds a bonded brake lining material. When brake is applied, shoe forces lining into brake drum

chain drive — use of a chain and sprocket to connect gearbox output shaft to rear wheel

chain stretch — wear of pins and bushings of a roller or hy-vo chain, causing chain to lengthen

chamfer — to bevel an edge of an object or to chamfer edges of port openings in a two-stroke cycle cylinder to prevent piston ring breakage

chassis — the base frame and components connected directly to it, excluding those parts which provide power, but may include wheels and suspension to become a "rolling chassis"

crankcase — castings that support and contain the crankshaft flywheel assembly, primary drive and gearbox

crash guards — usually an accessory, a frame or tubular structure that provides protection to the motorcycle in the event of upset or spill

cylinder head — casting that seals top of cylinder and provides a mounting place for spark plug. In four-stroke cycle engine, cylinder head also incorporates an intake and exhaust ports; both two- and four-stroke cycle engines also have combustion chamber built into cylinder head

damper — device which uses oil metered through orifices to control abrupt suspension movement during extension and compression

damper rod — tube secured to bottom of each fork slider to hold slider onto fork leg; damper rod controls movement of front suspension by metering hydraulic fluid through orifices in rod

decarbonize — to remove carbon build-up on piston, combustion chamber, and other parts

desmodromic — this type of valve train pertains to engine valves that open and close without the use of springs such as gear-driven valves

drive plate — drive plate has friction material bonded to its surface; when clutch is engaged, drive plate transfers power to driven plate

driven plate	a clutch plate which is indexed onto clutch inner hub by tabs or splines around its inside diameter; driven plate is usually a plain plate (no friction material) and drives gearbox input shaft through clutch inner hub
dry sump	in this system, oil is gravity fed to supply side of oil pump from a remote oil tank. After oil has been pumped through four-stroke cycle engine, it is returned to oil tank by return side of oil pump
final drive	chains and sprockets or shafts and gears used to connect the gearbox output shaft to rear wheel
gearbox	a series of shafts and gears which varies ratio of engine to rear wheel speed; motorcycle gearboxes use from two to seven speeds or ratios
hydraulic brake	a braking system using hydraulic fluid, piston, and cylinders to provide extremely high pressure for brake application
hy-vo chain	also known as the silent chain, is a very strong chain made up of toothed plates positioned side by side and held together by pins; advantage of this type of chain is great strength and quiet operation
lateral runout	side-to-side movement (wobble) of a wheel rim
master cylinder	components in a braking system that produces hydraulic pressure for system.
mechanical brake	a braking system which uses a mechanical advantage by way of levers and cables or rods to apply brakes; a braking system not using hydraulic fluids or hydraulics
metal sinter	describes the complex compounds used in brake and clutch friction materials
O-ring	a ring made of neoprene that is used to provide a positive seal. It usually fits into a groove slightly shallower than O-ring, and mated against a flat surface to provide a seal for oil, fuel or air
primary chain drive	a primary drive design that uses a chain and sprocket to transfer engine power from crankshaft to clutch
primary drive	use of chain, gear, or belt drive to connect crankshaft to clutch and gearbox into shaft
push rod	in four-stroke cycle engine, push rods provide means of transferring tappet movement to rocker arm, which opens valves
recondition	to rebuild a component or return to within factory specifications
shift drum	a drum shaped gearbox component with slots around its outside diameter; it engages with shift mechanism and shift forks; as drum is rotated, drum slots cause shift forks to move sliding gears or dogs causing engagement and disengagement of various gearbox ratios
shifting fork	a flat forked gearbox component which engages with a slot in a sliding gear or dog; shifting forks slide back and forth on lateral shafts; rotation of shift drum or cam plate causes shift fork to move its sliding gear or dog to engage with another gear, locking both gears to shaft

spoked wheel	a wheel consisting of a rim, spokes, nipples and hub; spokes are laced between hub and rim and are attached to rim by nipples; thirty-six or forty spokes are normally used
sprocket/pulley	a sprocket consists of a wheel with teeth to engage a chain or toothed belt and provide a positive (non-slip) drive; in the case of a belt final drive, often the toothed sprockets are referred to as "pulleys"
stamped frame	a frame stamped from pieces of sheet metal which are welded together to provide support for engine and suspension
stamped wheel	a wheel assembly using stamped sheet metal spokes in place of small wire type spokes; a stamped wheel resembles a cast alloy wheel in appearance
steering damper	a device which uses friction or a hydraulic damper to reduce steering oscillation
steering head	forward part of frame providing a mounting place for bearings which locate and support steering spindle and fork assembly
suspension	components which absorb road surface irregularities to smooth motorcycle ride it is designed to permit controlled wheel movement over irregular surfaces; Basic parts include forks, swing arm and shock absorbers
swing arm	main member of rear suspension that provides a mounting place for rear wheel and one end of shock absorbers
system fault interrupters	these components are safety switching components that won't let a system work unless the correct monitors are in place
telescopic fork	front suspension unit made up of two fork tubes and two sliders that telescope up and down tubes against spring pressure
torque converter	a fluid turbine which takes place of clutch in primary drive; oil is used to transmit power through torque converter depending upon engine rpm
triple clamps	a pair of sturdy brackets that provide a mounting place for fork legs and steering spindle triple clamps attach forks to frame through spindle, steering head and steering head bearings
valve train	all components which directly influence valve operation (cam, cam chain, cam followers, valves, valve springs, valve collars, and keepers in SOHC engine)
variable exhaust valve	the exhaust control valve operates by opening and closing thereby varying the exhaust pressure or back pressure to help scavenge gases more effectively as related to RPM

BLOCK AND TASK WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	5	5	NV	ND	9	ND	ND	8	5	ND	5	ND	6%

Task 1 Uses tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	70	NV	ND	50	ND	ND	30	25	ND	58	ND	47%

Task 2 Organizes work.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	20	10	NV	ND	20	ND	ND	30	25	ND	22	ND	21%

Task 3 Performs routine work practices.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	30	20	NV	ND	30	ND	ND	40	50	ND	20	ND	32%

BLOCK B CHASSIS AND SUSPENSION

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	13	10	NV	ND	10	ND	ND	7	10	ND	10	ND	10%

Task 4 Diagnoses chassis.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	20	NV	ND	15	ND	ND	15	15	ND	10	ND	17%

Task 5 Services chassis and components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	20	NV	ND	20	ND	ND	25	30	ND	20	ND	23%

Task 6 Diagnoses suspension.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	20	NV	ND	20	ND	ND	25	15	ND	15	ND	20%

Task 7 Services suspension system.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	40	NV	ND	45	ND	ND	35	40	ND	55	ND	40%

BLOCK C WHEELS AND TIRES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	3	10	NV	ND	7	ND	ND	9	10	ND	8	ND	8%

Task 8 Inspects wheels and tires.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	70	40	NV	ND	40	ND	ND	25	25	ND	23	ND	37%

Task 9 Services wheels and tires.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	30	60	NV	ND	60	ND	ND	75	75	ND	77	ND	63%

BLOCK D BRAKES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	10	10	NV	ND	12	ND	ND	9	10	ND	8	ND	10%

Task 10 Diagnoses braking systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	30	NV	ND	50	ND	ND	30	40	ND	43	ND	40%

Task 11 Services braking systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	70	NV	ND	50	ND	ND	70	60	ND	57	ND	60%

BLOCK E ENGINES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	13	15	NV	ND	15	ND	ND	15	15	ND	15	ND	15%

Task 12 Diagnoses four-stroke engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	35	30	NV	ND	30	ND	ND	30	30	ND	55	ND	35%

Task 13 Services four-stroke engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	35	50	NV	ND	30	ND	ND	30	40	ND	23	ND	35%

Task 14 Diagnoses two-stroke engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	15	10	NV	ND	20	ND	ND	20	10	ND	12	ND	14%

Task 15 Services two-stroke engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	15	10	NV	ND	20	ND	ND	20	20	ND	10	ND	16%

BLOCK F POWER TRANSFER

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	15	10	NV	ND	12	ND	ND	12	15	ND	7	ND	12%

Task 16 Diagnoses clutches and primary drive.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	17	20	NV	ND	15	ND	ND	15	10	ND	15	ND	15%

Task 17 Services clutches and primary drives.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	17	30	NV	ND	20	ND	ND	25	15	ND	15	ND	21%

Task 18 Diagnoses transmissions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	17	10	NV	ND	15	ND	ND	15	20	ND	23	ND	17%

Task 19 Services transmissions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	16	10	NV	ND	25	ND	ND	25	20	ND	12	ND	18%

Task 20 Diagnoses final drive.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	17	10	NV	ND	15	ND	ND	5	20	ND	25	ND	15%

Task 21 Services final drive.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	16	20	NV	ND	10	ND	ND	15	15	ND	10	ND	14%

BLOCK G ELECTRICAL SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	13	15	NV	ND	15	ND	ND	15	15	ND	20	ND	15%

Task 22 Diagnoses electrical systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	40	NV	ND	60	ND	ND	80	70	ND	80	ND	63%

Task 23 Services electrical systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	60	NV	ND	40	ND	ND	20	30	ND	20	ND	37%

BLOCK H VEHICLE MANAGEMENT SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	15	10	NV	ND	11	ND	ND	10	5	ND	17	ND	11%

Task 24 Diagnoses vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	40	NV	ND	60	ND	ND	80	60	ND	85	ND	63%

Task 25 Services vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	60	NV	ND	40	ND	ND	20	40	ND	15	ND	37%

BLOCK I FUEL AND EXHAUST SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	13	15	NV	ND	9	ND	ND	15	15	ND	10	ND	13%

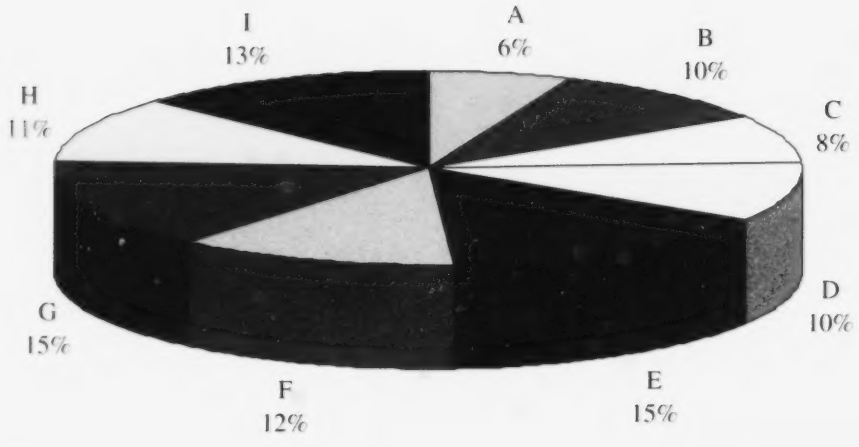
Task 26 Diagnoses fuel and exhaust systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	40	NV	ND	60	ND	ND	40	30	ND	80	ND	50%

Task 27 Services fuel and exhaust systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	60	NV	ND	40	ND	ND	60	70	ND	20	ND	50%

PIE CHART*



TITLES OF BLOCKS

Block A	Occupational Skills	Block F	Power Transfer
Block B	Chassis and Suspension	Block G	Electrical Systems
Block C	Wheels and Tires	Block H	Vehicle Management Systems
Block D	Brakes	Block I	Fuel and Exhaust Systems
Block E	Engines		

* Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 to 150 multiple-choice questions.

TASK PROFILE CHART – MOTORCYCLE MECHANIC (2006)

BLOCKS	TASKS	SUB-TASKS					
A OCCUPATIONAL SKILLS	**1. Uses tools and equipment.**	1.01 Uses hand tools.	1.02 Uses power tools.	1.03 Uses pneumatic tools.	1.04 Uses cutting and heating tools and equipment.	1.05 Uses measuring tools.	1.06 Uses shop equipment.
		1.07 Uses diagnostic and testing tools.	1.08 Uses personal protective equipment (PPE) and safety equipment.				
	2. Organizes work.	2.01 Communicates with others.	2.02 Uses documentation and reference tools.	2.03 Maintains safe work environment.			
	3. Performs routine work practices.	3.01 Uses trade-related consumables.	3.02 Performs periodic maintenance.	3.03 Performs storage procedures.	3.04 Assembles new motorcycle.	3.05 Conducts pre-delivery inspection (PDI).	3.06 Conducts safety inspection.
B CHASSIS AND SUSPENSION	**4. Diagnoses chassis.**	4.01 Diagnoses frame.	4.02 Diagnoses steering head.	4.03 Diagnoses steering dampers.	4.04 Diagnoses handle bars and controls.	4.05 Diagnoses foot rest and controls.	4.06 Diagnoses ancillary and accessory components.
	5. Services chassis and components.	5.01 Services frame.	5.02 Services steering head.	5.03 Services steering dampers.	5.04 Services handle bars and controls.	5.05 Services foot rests and controls.	5.06 Services ancillary and accessory components.
	6. Diagnoses suspension.	6.01 Diagnoses front suspension components.	6.02 Diagnoses rear suspension components.	6.03 Diagnoses swing arm.			
	7. Services suspension system.	7.01 Services front suspension components.	7.02 Services rear suspension components.	7.03 Services swing arm.			

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BLOCKS	TASKS	SUB-TASKS					
C WHEELS AND TIRES	**8. Inspects wheels and tires.**	8.01 Inspects tires.	8.02 Inspects spoked wheels.	8.03 Inspects solid wheels.	8.04 Inspects two-piece wheels.		
	9. Services wheels and tires.	9.01 Services tires.	9.02 Services spoked wheels.	9.03 Services solid wheels.	9.04 Services two-piece wheels.		
D BRAKES	**10. Diagnoses braking systems.**	10.01 Diagnoses hydraulic braking systems.	10.02 Diagnoses mechanical braking systems.	10.03 Diagnoses braking control systems.			
	11. Services braking systems.	11.01 Services hydraulic braking systems.	11.02 Services mechanical braking systems.	11.03 Services braking control systems.			
E ENGINES	**12. Diagnoses four-stroke engines.**	12.01 Diagnoses cylinder heads on four-stroke engine.	12.02 Diagnoses valve train on four-stroke engine.	12.03 Diagnoses cylinders and pistons on four-stroke engine.	12.04 Diagnoses crankshaft assembly on four-stroke engine.	12.05 Diagnoses counterbalance assemblies on four-stroke engine.	12.06 Diagnoses engine cases on four-stroke engine.
		12.07 Diagnoses lubrication system on four-stroke engine.	12.08 Diagnoses cooling system on four-stroke engine.				
	13. Services four-stroke engines.	13.01 Services cylinder heads on four-stroke engine.	13.02 Services valve train on four-stroke engine.	13.03 Services cylinders and pistons on four-stroke engine.	13.04 Services crankshaft assembly on four-stroke engine.	13.05 Services counterbalance assemblies on four-stroke engine.	13.06 Services engine cases on four-stroke engine.
		13.07 Services lubrication system on four-stroke engine.	13.08 Services cooling system on four-stroke engine.				

BLOCKS	TASKS	SUB- TASKS					
	14. Diagnoses two-stroke engines.	14.01 Diagnoses cylinder heads on two-stroke engine.	14.02 Diagnoses valve system on two-stroke engine.	14.03 Diagnoses cylinders (barrels) and pistons on two-stroke engine.	14.04 Diagnoses crankshaft assembly on two-stroke engine.	14.05 Diagnoses engine cases on two-stroke engine.	14.06 Diagnoses lubrication system on two-stroke engine.
		14.07 Diagnoses cooling system on two-stroke engine.					
	15. Services two-stroke engines.	15.01 Services cylinder heads on two-stroke engine.	15.02 Services valve system on two-stroke engine.	15.03 Services cylinders and pistons on two-stroke engine.	15.04 Services crankshaft assembly on two-stroke engine.	15.05 Services engine cases on two-stroke engine.	15.06 Services lubrication system on two-stroke engine.
		15.07 Services cooling system on two-stroke engine.					
F POWER TRANSFER	**16. Diagnoses clutches and primary drive.**	16.01 Diagnoses primary drive gears.	16.02 Diagnoses primary drive chains and sprockets.	16.03 Diagnoses primary drive belts and pulleys.	16.04 Diagnoses manual clutches.	16.05 Diagnoses automatic clutches.	16.06 Diagnoses kick start.
	17. Services clutches and primary drives.	17.01 Services primary drive gears.	17.02 Services primary drive chains and sprockets.	17.03 Services primary drive belts and pulleys.	17.04 Services manual clutches.	17.05 Services automatic clutches.	17.06 Services kick start.
	18. Diagnoses transmissions.	18.01 Diagnoses constant mesh transmissions.	18.02 Diagnoses variable ratio belt transmissions.	18.03 Diagnoses automatic transmissions.			
	19. Services transmissions.	19.01 Services constant mesh transmissions.	19.02 Services variable ratio belt transmissions.	19.03 Services automatic transmissions.			
	20. Diagnoses final drive.	20.01 Diagnoses final drive chains and sprockets.	20.02 Diagnoses final drive shaft and gears.	20.03 Diagnoses final drive belts and sprockets/ pulleys.			

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BLOCKS	TASKS	SUB- TASKS					
	21. Services final drive.	21.01 Services final drive chains and sprockets.	21.02 Services final drive shaft and gears.	21.03 Services belts and sprockets/ pulleys.			
G **ELECTRICAL SYSTEMS**	**22. Diagnoses electrical systems.**	22.01 Diagnoses battery and charging system.	22.02 Diagnoses ignition system.	22.03 Diagnoses starting system.	22.04 Diagnoses ancillary and accessory components.		
	23. Services electrical systems.	23.01 Services battery and charging system.	23.02 Services ignition system.	23.03 Services starting system.	23.04 Services ancillary and accessory components.		
H **VEHICLE MANAGEMENT SYSTEMS**	**24. Diagnoses vehicle management systems.**	24.01 Diagnoses emission systems.	24.02 Diagnoses electronic control unit (ECU).				
	25. Services vehicle management systems.	25.01 Services emission systems.	25.02 Services electronic control unit.				
I **FUEL AND EXHAUST SYSTEMS**	**26. Diagnoses fuel and exhaust systems.**	26.01 Diagnoses fuel tanks and components.	26.02 Diagnoses air delivery system.	26.03 Diagnoses carburetor.	26.04 Diagnoses fuel injection systems.	26.05 Diagnoses exhaust system.	26.06 Diagnoses turbochargers.
	27. Services fuel and exhaust systems.	27.01 Services fuel tanks and components.	27.02 Services air delivery system.	27.03 Services carburetor.	27.04 Services fuel injection systems.	27.05 Services exhaust system.	27.06 Services turbochargers. **(NOT COMMON CORE)**